जहाँ है हरियाली ।
वहाँ है खुशहाली ।।
सत्यमेव जयते

Government of India
Ministry of Environment & Forests

Paryavaran Mitra

HAND PRINT
Action Towards Sustainability

Teacher's Handbook

Linked to the NCF 2005 Syllabus for the Elementary Level **(Std VI, VII and VIII)**
prepared by National Council of Educational Research and Training (NCERT)

Explore | Discover | Think | Act

ArcelorMittal

CEE
Centre for Environment Education

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The Paryaravan Mitra Teachers' Handbook provides information, syllabus-linked activities, and project ideas to create Paryaravan Mitra students and schools.

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Preface

When the Indian constitution was written, it took inspiration from the over 5,000 years of history of our country and the unique connection its people have had with their environment. Article 51 A (g) which describes the Fundamental Duties of a citizen of India includes the clause, "to protect and improve the natural environment including forests, lakes, rivers and wild life, and to have compassion for living creatures".

Environmental awareness and understanding have always been a critical part of school curricula in India and new educational efforts stressed this even more. Gandhiji's basic education considers that "true education must correspond to the surrounding circumstances or it is not a healthy growth." Ravindranath Tagore mentioned that "the highest education is that which does not merely give us information but makes our life in harmony with all existences."

India was one of the first countries in the world to stress that protecting the environment was essential for dealing with problems of development. Indira Gandhi, the then Prime Minister of India drew attention to this, stating that poverty was the worst polluter. She highlighted the link between environmental conservation and elimination of poverty.

When the Ministry of Environment and Forests (MoEF) was yet a department, it decided that a key part of the country's strategy should be better environmental education (EE). It helped set up the Centre for Environment Education in 1984 as a Centre of Excellence in EE and through this took a major initiative in impacting EE at all levels including schools.

Several EE initiatives were taken up by NGOs at the non-formal level. Wildlife and eco-clubs as well as camping activities by WWF-India were some of these early initiatives. In the 70s, the Vikram A. Sarabhai Community Science Centre (VASCSC) had engaged in a pioneering programme to get students to measure pollution levels in the atmosphere and in water. The New Education Policy, 1986 and the Massive Teacher Training Programme led by NCERT resulted in lakhs of teachers across the country being trained in the activity method for EE. CEE and VASCSC participated in this producing the teacher guide "Joy of Learning" that gave practical examples of what students could do at the class level. Activities were described but built into them were possibilities for variation to suite local conditions.

In 1991, the Supreme Court giving its judgment in a public interest litigation case stated "We accept on principle that through the medium of education, awareness of the environment and its problem related to pollution should be taught as a compulsory subject." In 1998 CEE had prepared a position paper arguing for the infusion approach supplemented to a special time and space for EE at the school level.

In 1999 CEE undertook for the MoEF, the initiative Strengthening Environment Education in School Systems. A study done by Bharati Vidyapeeth University, Institute of Environment Education and Research (BVIEER) analysed the EE component in text books of all levels of school education across the country. Gaps were identified in the curricula and suggestions for possible inclusion of environmental aspects identified. By the year 2000, CEE had initiated an intensive programme targeted at the school/ classroom level. The Environment Education in Schools of Andhra Pradesh (EESAP) was a pilot initiative covering all districts of the state. These and several other efforts led to a model syllabus being formed in 2003 by the NCERT.

Simultaneously several co-curricular activities were being offered at the school level that made students aware of environmental issues. In 2001, the MoEF launched the National Green Corps

(NGC) encouraging schools to set up eco-clubs. The programme reached out to about 250 schools in each district of India. But the need for the whole school approach remained.

2005 marked the beginning of the UN declared the Decade of Education for Sustainable Development. In January of that year, the first International Conference titled "Education for a Sustainable Future" was held at CEE. In what was adopted as the Ahmedabad Declaration, it stated that "a key to sustainable development is the empowerment of all people, according to the principles of equity and social justice, and that a key to such empowerment is action-oriented education." CEE's programmes were focused on not just creating awareness but led to action. The EESAP started using the symbol of the handprint to indicate positive action towards sustainability. This was a powerful new concept and symbol of Education for Sustainable Development (ESD). In 2007, this concept was launched at the Fourth International Conference on Environment Education, jointly held by UNESCO, the Ministry of Human Resource Development, Government of India and CEE. In 2010, the Conference, Ethical Frameworks for a Sustainable World, highlighted the importance of integrating ethics and values for a sustainable world in ESD.

In 2008, UNEP had selected "CO2: Kick the Habit" as the slogan for the World Environment Day. It seemed strange to approach schools in villages, which may barely have an electric connection, to ask them to "kick the habit". In India CEE changed the campaign to "CO2: Pick Right", indicating the need to look at alternate paths to sustainability. The need was to have an education that lead to critical thinking and students daring to try new paths towards sustainability. ESD called for a new paradigm of education.

The campaign also led to schools participating in a unique exercise to find a "Paryavaran Ambassador" for India. Of 2 lakh schools who participated, 70, 000 replied and the overwhelming choice was Dr. A. P. J. Abdul Kalam, former President of India. At the event to formally name Dr. Kalam as the ambassador, he called on children to plant billion trees for billion people.

The event also saw the emergence of a unique partnership between MoEF, CEE and ArcelorMittal coming in as a corporate partner. This led to the Paryavaran Mitra programme "network of 20 million children". It was a major challenge. Paryavaran Mitra was seen as a way of supplementing the NGC a club approach with a whole school and class room approach. It would lead to fulfilling the changes brought about in the curriculum through National Curriculum Framework, 2005.

This handbook is a compilation of ideas and activities that can be used by the expanding network of Paryavaran Mitra schools across the country. The Handbook provides resources to a teacher to transact the content of the textbooks in the classroom through various activities and extend the concepts to real life projects that are an attempt to solve the problems in immediate surroundings. Paryavaran Mitra complements the decision to introduce Project based learning in schools as part of the decision to implement compulsory environmental education. The infusion approach and PBL by definition are a multidisciplinary approach to education.

Paryavaran Mitra cuts across various subjects and encourages teachers to collaborate for teaching and learning and to explore the environment and sustainable solutions together with their pupils.

Kartikeya V. Sarabhai
Director
Centre for Environment Education

To the Principal

We are happy to share with you the Paryavaran Mitra Teacher's Handbook. You have already shown your initiative by joining the Paryavaran Mitra programme. As the leader and mentor of the school you have a very important role in making your school a Paryavaran Mitra school. This Handbook is intended to help you and your school in this process.

The Handbook includes the vision of the programme and a framework for making the school, the classroom, the home and the community as places where students can be engaged in Exploring, Discovering, Thinking, and Sharing, and also in undertaking positive Action for environmental sustainability. The activities and project ideas given in the Handbook provide opportunities to build a variety of skills and capacities of the students, and engage them in projects mandated now for environmental education. The Handbook however s not intended to replace the textbook. Rather it provides resources to enrich and support the teaching-learning experience.

Your continued commitment will be needed to ensure that this Handbook and the Paryavaran Mitra activities are not limited to a single teacher or class. It is important that all teachers of classes 6, 7 and 8 take up the Activities in the class, at the appropriate points that best connect with what they are teaching. The links with the concepts in the NCERT Science and Social Science syllabus have been provided. In case of Action Projects not only subject teachers but also other members of the school staff may be actively involved. The Handbook also provides many ideas for whole school activities, for which your support and guidance are critical.

We are sure that you will lead your school by communicating the essence of the programme, and creating a vibrant climate for the students to become Paryavaran Mitra.

Paryavaran Mitra Team

1 Introduction

The Paryavaran Mitra programme was launched in Ahmedabad on 24 July 2010 by the Paryavaran Ambassador, Dr. APJ Abdul Kalam, with a goal to create a network of two crore young leaders, from schools across the country, having the awareness, knowledge, commitment and potential to meet the challenges of environmental sustainability in their spheres of influence. The first step in this momentous movement is to engage with students who will be inspired and guided to become Paryavaran Mitra in every aspect of their life, and in every sphere–at school, at home and in the community.

The Paryaravaran Mitra programme visualizes the engagement of all students in understanding and recognizing environmental issues in a larger context and also in the context of their immediate environment. It promotes a learning-by-doing approach in the class and curriculum transactions, and also active participation by all members of the school community in addressing the issues related to five themes — Water and Sanitation, Waste Management, Energy, Biodiversity and Greening, and Culture and Heritage — in the school context, through action projects.

The programme is designed so as to strengthen and enrich the ongoing curricular and co curricular school activities, in the context of the national initiatives and imperatives of the Government of India including the Supreme Court Directive with reference to Environmental Education, National Curriculum Framework 2005, and the Continuous and Comprehensive Evaluation.

The Paryavaran Mitra programme aims to strengthen Environmental Education (EE) as mandated by the Honourable Supreme Court's Order of 22 November 1991 in response to the PIL (Writ Petition (Civil) No. 860 of 1991) filed by Shri M C Mehta in 1991 for compulsory EE. The Order stated, "We accept on principle that through the medium of education, awareness of the environment and its problem related to pollution should be taught as a compulsory subject." Further, the Honorable Supreme Court in its judgment of 18 December 2003 directed that the NCERT shall prepare a Model syllabus of Environment Education. The NCERT developed the Model syllabus and submitted it to the Honourable Supreme Court.

The PIL of 1991 was deemed fully disposed off based on the Affidavit (October 2007) submitted by the NCERT and accepted by the Honorable Supreme Court in December 2010. The Affidavit, a key document, outlined the sequence of relevant events subsequent to the PIL up to proposal for how EE may be transacted from classes 1 to 12. As per the judgement, infusion approach has been adopted for Environmental Education for middle school grades. The Paryavaran Mitra programme focuses on class 6 to 8, and follows the infusion approach by promoting active teaching–learning methodologies that bring in an environmental perspective to concepts and topics in the curriculum.

Today the Project-based learning approach is being recommended for engaging all the students for EE. The Paryavaran Mitra programme includes a strong component of involving students in Action Projects related to the critical themes. The projects planned and implemented in the five

thematic areas may not lead to immediate or significant improvement in environmental quality, but will definitely lay the foundation for sustained efforts that will build up to impact significantly.

Through the scholastic and co-scholastic approach, the Paryavaran Mitra programme is strengthening the implementation of the Supreme Court judgment by suggesting both, class activity-based approach and action projects.

The National Curriculum Framework 2005 recognises the primacy of children's experiences, their voices and their active involvement in the process of learning. Learning experiences at school should pave the way for construction of knowledge and fostering creativity and become a source of joy, not stress. Curricular transactions seek hands-on experiences and project based approaches (NCF, 2005)

The class activities and action projects are pedagogic approaches for development of critical skills that help a student to develop the ability and willingness to make informed decisions, communicate effectively, and develop management skills to lead a healthy and productive life. These approaches will also help to explore and learn about his/her environment which is dynamic, and determine the behaviour change at individual and community level. This calls for a different approach to evaluating.

The Continuous and Comprehensive Evaluation (CCE) system suggests assessment of the students through observing "participation in school activities relating to improvement in environment, participation in community activities relating to environment, behaviours showing sensitiveness and concerns to environmental degradation and initiatives for betterment of the environment". The Paryavaran Mitra programme provides opportunities to students to engage in hands-on experiences that change behaviour.

The Paryavaran Mitra programme with its emphasis on Explore, Discover, Think, Share, and Act takes student experiences beyond the classroom and into the larger school and community.

Paryavaran Mitra Programme

What is the Paryavaran Mitra Programme?

Paryavaran Mitra is a nationwide initiative to create a network of 2 crore young leaders, from schools across the country, who have the awareness, knowledge, commitment, and potential to meet the challenges of environmental sustainability in their own spheres of influence.

The student is the prime focus of the Programme. A student, as a Paryavaran Mitra, shows commitment to make a difference by taking action. The action could be towards resolving a local issue, or to improve the condition within the school premises, and at home, or in the community in five thematic areas: Water and Sanitation, Energy, Biodiversity and Greening, Waste Management, and Culture and Heritage.

This action will be achieved through developing understanding on environmental sustainability, inculcating the required attitude and values towards environmental sustainability, and building skills through hands-on experience in the immediate environment.

The success of the programme rests upon the support and guidance of the principal or headmaster. The commitment of all the teachers in taking up programme activities in the class, clubs, and the whole school will encourage active participation of all the students within the school, at home and in the community.

The commitment to make a difference will reflect in practices at school and at home. For example, if students have taken part in activities and projects related to waste management, the difference should be visible and sustained. This would be a litter-free school which would include use of dust bins, segregation of waste, following the 3 Rs (Reduce, Reuse, Recycle). These actions should also be demonstrated in the home.

A Paryavaran Mitra, demonstrates environmental citizenship qualities through positive change in behaviour and action at individual, school, family and community levels. Not only students, but also teachers, principals, parents, and all those who demonstrate these qualities become Paryavaran Mitra.

The aim of education must be the training of independently acting and thinking individuals who, however, see in the service of community, their highest life and achievement.

Albert Einstein

Who is a Paryavaran Mitra?

A Paryavaran Mitra is one who demonstrates:

1. Awareness
2. Understanding
3. Critical thinking
4. Ability to learn
5. Desire to do
6. Action
7. Skills to take action
8. Values
9. Empowerment
10. Ability to take initiative

What enables one to be a Paryavaran Mitra?

Knowledge

- Understand about the resources of the earth: soil, water, air, energy, and all living things.
- Understand the interrelatedness and interdependence amongst all living things.
- Understand about the dependence of humans on the environmental resources for life and sustenance.
- Understand the fragility of the physical and natural environment and limitedness of resources.
- Understand the implications of overuse and misuse of resources.
- Recognise the importance of environmental quality and the importance of sustainablility
- Understand about ourselves, our potential and limitations, our relationships with society, environment and world.
- Understand the potential and impacts of economic growth based on production and consumption.
- Recognise and understand practices, traditions and values that foster sustainability.
- Believe and understand that each of us has both the power and the responsiblity to effect positive change at all levels – from local to global.

Opportunities and Experiences

- To ask critical questions.
- To clarify one's own values.
- To think systematically.
- To apply the learning to a real situation.
- To envision a more positive and sustainable future.

Skills

- To undertake appropriate investigations of the local environment– natural, cultural and social.
- To analyze and identify the possible solutions.

Now more than ever we need people who think broadly and who understand systems, connections, patterns, and root causes.

David Orr

- To develop plans and strategies to take appropriate action.
- To communicate and share information.

Values and Attitudes

- Value and appreciation for diversity
- Empathy, appreciation and caring attitude towards the natural and social environment.
- A sense of self worth and confidence in the power of individual action.
- Appreciation of the importance and worth of individual responsibility and action.
- Personal acceptance of a sustainable lifestyle and a commitment to participation in change.

Why Paryavaran Mitra in Schools?

School is a place where students spend 5 to 8 hours a day, for an average 200 days of a year. In fact, this is where a considerable part of their waking hours are spent. The school time and space provide ample opportunity for not only syllabus-related learning, but also the development of life-skills through extracurricular and co-curricular activities. Thus the school provides a structured opportunity for students to gain knowledge and experiences, develop skills and imbibe values and attitudes, and be enriched through peer learning, all of which contribute to making a Paryavaran Mitra.

The school becomes the crucible for applying what has been learnt. Every student takes back the experiences and learnings from the school to his/her home/community, thus the school becomes the route to reach out to the community. Introducing the Paryavaran Mitra programme in school, is a way to reach out and involve the entire community.

What makes a school a Paryavaran Mitra School?

- A school that provides the curricular and co-curricular support, time and space for students and teachers to be actively engaged in learning-by-doing and taking positive action.
- A school which provides opportunities for students to equally develop scholastic and co-scholastic skills, especially life skills.
- A school that encourages positive values and attitudes towards all the dimensions of the environment including the natural, social and cultural dimensions.
- A school that celebrates diversity and inculcates respect and appreciation for culture and heritage.
- A school that that demonstrates positive action and results, especially in the areas of Water and Sanitation, Energy, Waste Management, Biodiversity and Greening.

In other words, it is a school that promotes Exploring, Discovery, Thinking, Sharing and Action.

It is not what is poured into the students, but what is planted, that really counts.

To the Teacher

Welcome to the Paryavaran Mitra Programme.

You have now taken on the important role of guiding students to become Paryavaran Mitra. This is a role which is above and beyond that of a subject or a class teacher. All teachers become Paryavaran Mitra guides and facilitators.

What does it mean to be a Paryavaran Mitra Teacher?

A Paryavaran Mitra teacher is:

- the key facilitator and motivator of the programme.
- one who supports and guides students in developing the qualities that will make them Paryavaran Mitra.
- one who engages students in inquiry and action, and promotes development of knowledge, skills and values through curricular and co-curricular opportunities.
- a role model who demonstrates his/her commitment to adopting a sustainable life-style and values, attitudes and behaviour that reflect this.

As you see, this calls for going beyond the content and information in textbooks and leading your students through a process to become Paryavaran Mitra. The first step in the process is awareness and knowledge, followed by the steps of developing values and attitudes, and building skills and capabilities to take positive action.

To take your students through this process, you would be engaging with your students in different ways within the class and outside. Your students will be directly involved in the process of Exploring, Discovering, Thinking, and Acting.

This process will need your facilitation. You will find that you need many ideas and methods that will give students the opportunities to learn by doing, and also to demonstrate their ability to take action.

As a Paryavaran Mitra teacher you will be creating these teaching-learning opportunities as part of your regular textbook lessons in the class, outside the class in the co-curricular periods, and also with smaller groups of students as part of action projects. You will be using some of these experiences for assessing your students under the Continuous and Comprehensive Evaluation system.

You would also be taking the lead in involving your whole school—all students, teaching and non-teaching staff, and parents in transforming your school into a Paryavaran Mitra school.

We appreciate that any new programme generates some apprehension, especially for those of you who are already stretched in carrying out numerous responsibilities. You may be concerned how you will be able to take on this additional responsibility, and what help you will get to take it up.

You may never know the results of your actions, but if you do nothing there will be no result. — *M K Gandhi*

This Handbook provides ideas and guidelines to support your new role as a Paryavaran Mitra teacher.

How will this Handbook help you?

As you will see the Handbook includes activity ideas for curricular linked teaching, tips for carrying out action projects, as well as suggestions for involving the whole school towards becoming a Paryavaran Mitra school.

The section **Class Activities** has activities that you can do as part of your regular class lessons. The activities are organised thematically. The themes are: **Water and Sanitation, Energy, Greening and Biodiversity, Waste Management, Culture and Heritage, and Climate Change.**

For the first four themes, the class activities are broadly linked to topics in the science and social science textbooks. The activities are not additional or extra to your regular class schedule. Rather, these activities provide alternative ways of teaching/complementing /supporting what is already in the textbooks, and thus will not require additional time.

The theme **Culture and Heritage** though not explicitly covered in the textbooks, it permeates all the subjects, and our day-to-day life, and thus a listing of suggested activities is provided rather than a detailed description of the steps. This section will become vibrant and meaningful only if you along with your students identify and explore and share the numerous local perspectives and dimensions, with the involvement of the community.

The theme of **Climate Change** is one which is increasingly being discussed, but for which comprehensive and comprehensible information is not easily available. This section provides the basic facts as well as activity ideas. It is important for students to understand both the science of the phenomena as well as the potential impacts, and also to perceive the links with lifestyles and consumer behaviour. This is critical for a generation which constitutes a huge consumer market and whose lifestyle, values and behaviour hold the key to a sustainable future.

In **Beyond the Classroom** section you will find ideas for taking your students outside the class, and tips on how to use these outings to engage your students meaningfully in exploring and discovering. You will also see how you could call upon the expertise of a variety of community members as resource persons to share their expertise and experience with the students, and thereby enrich and contextualise the textbook learnings.

The section on **Action Projects** shares examples of projects taken up by students and teachers like you with respect to some of the issues related to the themes. These will give you many ideas of how to involve your students in different kinds of action projects, and help to understand the different dimensions and steps in the process. These are examples and not blueprints to be followed. You could choose the issue that is of direct relevance and concern in your own context, and refer to the listing of steps, activities, methods and skill sets to guide your students to undertake an action project.

As teachers we have the opportunity to guide young people to become informed, healthy, responsible caring citizens of the future.

A Paryavaran Mitra School includes a menu of ideas and guidelines that will help you to go beyond your role as Class and Club teacher, to taking the lead transforming the whole school into a Paryavaran Mitra school using the opportunities when the whole school can be involved such as assembly time, celebration of important days and other common spaces and occasions.

How to be a Paryavaran Mitra School section gives step-by-step guidelines on how to set up and maintain different facilities/systems which will help make your school a Paryavaran Mitra School.

By taking up your role as a Paryavaran Mitra teacher, you have already shown your motivation and commitment. We are confident that you will be the role model and leader in this nationwide movement.

Class Activities and Action Projects

The Paryavaran Mitra programme calls for the active engagement of students through both the class activities and action projects.

Before we go into the details of each, it would be helpful to understand what we mean by these two.

As teachers we have the chance to participate in the fun and wonder of young people as they learn about this wonderful world, and also the opportunity to make a difference.

Class Activities

The word Class is used here to mean the entire group of students in let us say class VI A. it does not refer to the physical space or the 'classroom'. An activity involving all the students, even if it is done in the playground or a field trip or visit, is a class activity.

- Class Activities are curricular. They can be effectively used to teach the text book lessons.
- The teacher takes the lead and plans the class activity so as to achieve the curricular objective.
- Class activities can be linked to the appropriate points in the textbook lesson where they can help in better explaining or demonstrating the concepts.
- The teacher needs to identify those points in the textbook lesson where the activities can be best used.
- These activities can be carried out as a part of the regular classroom teaching within the prescribed time/period.
- Class activities are useful to the teacher for assessment, evaluation, assignments, class work and homework.
- The class activity is primarily between the teacher and students in the class, (although at different points other teachers and resource persons can come in).

The entire class/all students need to be involved in class activities. You can decide how best this can be done. For example, if one group is actually carrying out an activity others can be involved in different roles such as preparing for the activity, observers, co-facilitators, etc. As the students are directly engaged in the learning experience, their involvement will be greater and they may be motivated to take the learning ahead, and apply it in action projects.

Thus, class activities can become steps in the process of carrying out a project as they help to systematically build understanding and linkages.

Action Projects

The Paryavaran Mitra programme encourages action projects undertaken by students working in groups. A group of students from the same class or a group including students from different classes can take the lead for a variety of activities—conducting rallies and campaigns, celebrating environmental days, and carrying out action projects.

- Action projects complement the curriculum and are linked to the syllabus though not precisely as prescribed in it.
- Action projects could be spread over a period of time and include a logical flow of activities for achieving the objectives or planned results.
- The students take the lead in planning and carrying out the activities and the teacher is the facilitator. The students see the teacher in a different role as a fellow team member rather

Student and teacher engagement is critical in the classroom because it has the power to define whose knowledge will become part of school-related knowledge and whose voices will shape it. *NCF 2005*

than a director of learning; this change of perception creates a different kind of dynamics between the teacher and the students.

- Action projects are important opportunities for building life skills as students get the chance to learn and apply skills in real-life situations. They provide opportunity for all round development.
- Action projects provide a greater opportunity for harnessing multiple skills and abilities of children therefore it builds confidence and self esteem of students who may not be academic high achievers (reading, writing, arithmetic), but may be gifted in other areas.
- In action projects it is not individual capability which gets assessed, but aspects like motivation, involvement, team work, etc.
- Action projects make it possible to understand that the school does not mean just 'classroom learning'
- Rather it helps to understand that the school is a community in itself. Projects make it possible to involve various members of the school community like school management, teachers, support staff, parents, etc.
- Action projects necessitate interactions with the larger school community and the outside community thus making important links. Learning is enriched by this linking.

The following pages discuss in greater detail both the approaches-class activities and action projects.

Paryavaran Mitra and Continuous Comprehensive Evaluation

The Paryavaran Mitra programme endorses the aims of education through providing structured opportunities and experiences both within and outside the class.The goal of the programme is to make students capable of becoming responsible, productive and useful members of society. Knowledge, skills and attitudes for this are built through learning experiences and opportunities created for learners in school.

How can these be assessed? What would be the indicators that tell us how students are progressing in terms of change in attitudes, values and ultimately behaviour?

The Continuous and Comprehensive Evaluation (CCE) Scheme of school based assessment advocates that assessment is not to be seen as a separate activity, or an extra burden, but as an integral part built into the teaching-learning process. CCE refers to the system of school-based evaluation of a student that covers all aspects of a student's development.

The term 'continuous' emphasizes that evaluation of identified aspects of students growth and development is a continuous process, rather than an event, built into the total teaching-learning process and spread over the entire academic session.

Never doubt that a small group of thoughtful committed citizens can change the world. Indeed it is the only thing that ever has.

Margaret Mead

The term 'comprehensive' covers both the scholastic and co-scholastic aspects of the student's growth and development. Scholastic aspects include curricular areas or subject-specific areas. Co-scholastic aspects include life skills, co-curricular activities, attitudes and values.

Abilities, attitudes and aptitudes can manifest themselves in forms other than the written word. Thus co-scholastic assessment requires the application of a variety of tools and techniques, and aims at assessing a learner's development in areas of learning like Knowledge, Understanding, Application, Analysing, Synthesising, Evaluating and Creating. Learning in scholastic and co-scholastic areas is demonstrated by change in behaviour in the learner.

It is in this context that students' engagement in both class activities and action projects as part of the Paryavaran Mitra programme become an important indicator for assessment.

Participation of students in Paryavaran Mitra activities in the class and action projects provides scope for assessing of several co-scholastic areas, as indicated in the Continuous and Comprehensive Evaluation Manual for Teachers classes VI to VIII, brought out by the Central Board of Secondary Education (CBSE). The relevant areas are indicated.

Section 4a Attitudes

Attitudes towards School Programmes and Environment

S. N	Descriptors	Score out of 5
1.	Attaches a lot of importance to school activities and programmes.	
2.	Participates in school activities relating to improvement of environment.	
3.	Enthusiastically participates in school programmes.	
4.	Shoulders responsibility happily.	
5.	Confronts any one who criticizes school and school programmes.	
6.	Insists on parents to participate/witness school programmes.	
7.	Participates in community activities relating to environment.	
8.	Takes care of school property.	
9.	Sensitive and concerned about environmental degradation.	
10.	Takes initiative in planning activities for the betterment of the environment.	
	Total	
	Average/Grade	

Section 4b Values

To value and preserve the rich heritage of your culture

	Descriptors	Score out of 5
a.	Reads and discusses about the Indian culture and heritage	
b.	Appreciates diversity of cultures, social practices and more	
c.	Treasures the belongings of the school, community and the country with a sense of pride	
d.	Protects and prevents defacing of national monuments	

To protect and improve natural environment

	Descriptors	Score out of 5
a.	Shows compassion for living creatures	
b.	Takes active interest in maintaining flora, fauna, plants and gardens	
c.	Participates in movements for protecting endangered animals and green cover	
d.	Takes care to clean classroom, school and neighbourhood	

To develop scientific temper and the spirit of enquiry

	Descriptors	Score out of 5
a.	Experiments to find new solutions	
b.	Analyzes and critically evaluates events on the basis of data and information	
c.	Questions and verifies knowledge	
d.	Explains processes and products logically	

To safeguard public property and to abjure violence

	Descriptors	Score out of 5
a.	Takes care of school furniture and property	
b.	Resists defacing and decimation of public property	
c.	Does not fight and harm others	
d.	Does not affiliate to groups and communities who believe and promote violence	

IV Class Activities

You are the class teacher of class 6. You know that your students have different abilities. Some are good at reading and writing, a few have strong oral skills, some are quick in calculations; some are skilled at making a working model. You know that if you use only the lecture method not all the students are attentive. But you do not know how else to engage all the students when you teach.

You are a teacher of class 7. In both geography and science you have to teach the concept 'distribution of water'. You write on the blackboard how much water there is in the oceans, rivers, underground, and ice caps (in percentages). When you ask the students to read the table and answer your questions, you find that there are confused by the numbers. You wish you had some other way to demonstrate this distribution.

You are the science teacher of class 8. You are not sure how to explain the terms Greenhouse Effect and Global Warming, and how these are related to the topic that all are talking about these days—Climate Change. You wish there was an interesting way to explain this.

You are teaching about degradable and biodegradable materials. The class 8 science textbook has a table giving the time frame for different materials to degenerate. How can you help the students to relate this to their own use of materials and products?

You are a social studies teacher of class 6. You are teaching a lesson on Diversity. The word itself may not mean much to the students. You decide that you will start your class by asking each student to say a sentence in his or her own language as it is spoken at home. You immediately get the entire class engaged. This provides a good introduction to the topic of linguistic diversity.

You have been assigned as the teacher in-charge of the Paryavaran Mitra programme. You are keen to involve the whole class in taking action for waste management. You realize that before they can do this, the students need to understand more about different kinds of waste and the related problems. You wonder what is a good way to link this understanding to our daily activities.

Introduction

Have you ever felt like any of the teachers described in the previous page? How have you addressed such needs of the learners? What are some challenges that you have faced?

As teachers you are more than familiar with your responsibilities and role within the classroom. For years you have planned and worked so as to fulfil the expectations of completing the syllabus within the time frame, and preparing your students for the examinations. In doing this you have prepared lesson plans, suitable teaching-learning aids and assignments.

As you have read, the Paryavaran Mitra programme focuses not just on transfer of information and knowledge, but on understanding the curricular concepts and seeing how these link to our immediate environment. This understanding combined with the necessary skills, attitudes and values will enable students to take positive action and become Paryavaran Mitra.

The National Curriculum Framework 2005 emphasises that children construct their own knowledge based on their experiences and understanding. The textbooks include a number of suggestions for this, but do not always provide you, as the teacher, with sufficient guidelines on how to facilitate these experiences. As teachers, who already have too much to do, you may not have the time to plan your class teaching in a way that fulfils the above mentioned expectations.

This Handbook provides some guidelines and suggestions for this.

As you have read, the Continuous and Comprehensive Evaluation (CCE) emphasizes the need for ways other than exams through which students' abilities, attitudes and aptitudes can be tested. The term 'comprehensive' covers both the scholastic and co-scholastic aspects of the students' growth and development including life skills, attitudes, and values. The Paryavaran Mitra programme offers ample opportunities to develop both these aspects.

As teachers you would need to develop a variety of tools and techniques to assess the learners' development in areas like knowledge, understanding, and application.

One way in which you could meet all the above requirements within the constraints of time, syllabus and student numbers, and your classroom realities, is by introducing the **activity approach** in the class. The activity approach is one of the tried and tested ways to make students active participants in the teaching learning process.

What is an Activity?

An activity, in our context, refers to an experience designed to involve and engage students in purposeful learning in order to achieve a specific objective. For example, playing a game based on characteristics of different animals will help to explain classification.

The activity is not an end in itself, it is the starting point for making a number of linkages, encouraging students to reflect, and also lead them to apply the learnings to their own context. The animal game not only would help students to clarify the concept that characteristics are the basis for 'Classification',

Participatory learning and teaching, emotion and experience need to have a definite and valued place in the classroom.
NCF 2005

but also builds the skill of logical thinking and deductive reasoning. In other words, an activity is a experience that promotes learning to learn.

An activity is not necessarily the same as engaging in busy or vigorous action such as dancing, or a physical game, or action song; or even using teaching-learning material. While these actions may be enjoyable in themselves, they may or may not translate into learning.

Characteristics of an Activity

- Learning takes place through the creation of a context and appropriate tasks, where children are engaged in doing something.
- An activity is not just physical but also mental, and involves reflection on what is being done and why it is being done?
- In the process of 'doing', children learn without being aware of what/how much they are learning.

(Source-educationmatters.blogspot.com)

How Will Activities Help?

Activities can:

- Clarify abstract concepts through practical experience or demonstration.
- Help understand concepts by contextualizing them to situations familiar to the students.
- Encourage linkages across subjects.
- Relate the students' local knowledge to the school knowledge.
- Help to connect textbook learning to learning outside the classroom.
- Encourage students to use multiple skills.
- Promote achieving several learning objectives at the same time.
- Help students to develop a variety of life skills.
- Encourage students to ask questions.
- Encourage students to explore, discover, think and construct new knowledge.
- Help in evaluation/assessment of both scholastic and co-scholastic areas.

Planning and Sequencing Activities through Unit Plans

Occasionally and randomly done activities may not achieve the objectives. It is necessary that the activities that you plan and sequence, have to be done in the context of the syllabus as well as your own classroom. This planning may be done as a Unit Plan rather than a Lesson Plan.

The components described in the Unit Plan and the Activity plan will help you as a facilitator to match the activity to the relevant lessons.

This part of the Handbook provides a variety of activity ideas. These are organized according to the themes and presented as Unit Plans. Based on the NCERT syllabus/textbook, Unit Plans for class VI, VII and VII have been suggested. The Unit Plan includes a number of activities that relate to the concepts.

The activities in this section are participatory, and can be done with easily available resources, along with a variety of approaches.

Tasks that are challenging and allow independent thinking and multiple ways of being solved, encourage independence, creativity and self discipline in learners.

NCF 2005

Class Activities: Overview

Key Concepts
Drawn from the NCERT syllabus of Science and Social Sciences.

Instructional Objectives
Indicate the expected learning outcomes (both scholastic and co-scholastic) from the activities.

Previous Knowledge
Assumes the level of knowledge and understanding that the students have, related to the concepts.

Teaching Points
Quick markers to indicate what you are going to cover in the unit.

Teaching and Learning Activities
Detailed descriptions of the activities that will help communicate the key concepts.

Objective
States what students would learn by going through this experience.

Teaching Aids
A listing of the materials (equipment, tabulated data, charts, etc) that will be required to carry out the activity.

Teaching Method
Indicates the approach/method of the activity.

Introduction
Provides the context or relevant information related to the concept.

How to Do?
Describes the activity in a step-by-step fashion.

Recap and Discussions
Provides questions and point to generate a discussion and invite students' observations, comments, and questions. Helps to recapitulate the experience and sum up key learnings.

Evaluation
Suggests a number of ways to assess the achievements of the learners and to gauge whether the objective and the planned learning outcomes have been achieved.

Home Assignment
Provides exercises that are useful to recall and reinforce the learnings and to relate these to one's own context.

UNIT PLAN: Class VI

Subject: Social Sciences/Science	**Unit:** Natural Resources: Water
Duration: 5 Class periods	**Concepts** • Importance of Water • Dependence of living things on water • Conserving water

Instructional Objectives

Students will be able to :

- Comprehend that living things need water to survive.
- Observe that water is an important natural resource.
- Identify the different uses of water.
- Estimate the amount of water used by a family.
- Identify news stories related to water shortage, floods, drought, etc.

Previous Knowledge	Teaching Points
• We use water for our daily activities • Water is available from wells, rivers, lakes, rain • Water is used for drinking, cooking, cleaning, and many other activities • Plants and animals require water	• Why is water important for all life? • Who all need water? • What all do we need water for? • How do we use water? • Do we sometimes waste it? • What happens when there is not enough water ? • Is water available to all? • How can we save water? • Who manages water at home?

Teaching and Learning Activities

Activity 1

Water is Important for Life

Objective	:	To understand that water is vital for all living beings
Teaching Method	:	Story telling, Drama
Teaching Aids	:	As needed for the skit
Group Size:	:	Entire class
Duration	:	30 minutes for introducing the activity, two days preparation time and 30 minutes for presentation.

Introduction

All living things—plants or animals—need water to live. They need to take in freshwater to replace metabolic losses and maintain life processes. Apart from this, some organisms may need water for living in, while others might not be able to breed except in water. Though the amounts of water required and the tolerance to lack of water are different for different organisms, none can do entirely without it.

How to Do?

Read the story out to the students. Follow it up with a discussion on the importance of water. Ask students to develop a skit based on the story. Give them 1-2 days to prepare.

Identify different tasks (writing the dialogues, direction, acting, props, stage decoration, etc.) for preparing the skit. Assign tasks to students depending on their abilities and skills. Ask students to work together to practice and put up the performance.

Recap and Discussion

Do the students to agree that water is the most important for all living things? What are the other things that are important for life?

Evaluation

What do we learn from this story? Ask students to write down in 5 sentences.

Millions of years ago life evolved in water.

Home Assignment

Ask students to learn poems and songs related to water (rivers, snow, oceans, lakes and ponds, rain) from their home and recite them in the class.

Who is Greater?

Once upon a time there was perfect harmony in the forest. There dwelt together, in harmony, animals, birds and trees. Occasionally the Neem and the Banyan trees quarrelled. One morning as the forest awoke to a bright new day, two angry voices pierced the air. It was the Neem tree and the Banyan tree.

The baby squirrel who lived in the Banyan tree was the unintentional cause of this quarrel. In a playful mood it ran up the Neem tree. Seizing this opportunity, the Neem tree teased the Banyan tree. Calling aloud, it said: "Who wants to stay with someone with such entangled branches? The Banyan tree retorted: "I am considered to be the best among trees, with good reasons. My vines and branches are home to hundreds of birds and animals. They provide shade to tired travellers. Animals and birds feed on my leaves and fruits. When you were born I was already 170 years old. What do you know about the world at 50 years of age?

The Neem tree said, "With due respect to you as an elder. But you should not take pride in your remarkable age. I have accomplished in 50 years what you took 170 years to do. Animals and birds live in my branches too, and they provide shade to man and beast alike. Most important, I serve the sick. My leaves and twigs are used for making herbal medicines. Although you are my senior, I am more useful than you". And so the trees went on. Each trying to make a longer list of how useful it was, for so many.

A frog from the nearby river was listening to their argument. Hopping out he bowed to both the trees. "What are you both quarrelling about? In your own capacities, both of you are useful. The question who is most important does not arise. I am sure you are aware that without water neither you nor I, nor any other living thing would have existed. If there is one thing every one of us needs, it is water. And yet, the wise water never boasts about its manifold uses."

Both trees understood what the frog meant–that without water no life was possible. They felt deeply ashamed and resolved not to get into petty fights again.

Activity 2

We All Need Water

Objective	:	To become aware of how important water is in almost every aspect of our life.
Teaching Method	:	Creative Expression, Discussion
Teaching Aids	:	Writing material
Group Size	:	Entire class
Duration	:	30 minutes

Introduction

Water use is such an automatic and habitual activity that we often do not realize how we use it every day. We put it to many direct uses in the house—cooking, washing, bathing, cleaning, drinking. There are also many indirect uses—the food we eat, the milk we drink, the clothes we wear—all these are produced through the use of water. But we seldom pause to think how dependent we are on water. Even becoming aware of the many uses of water may make a difference in our water use.

How to Do?

The activity requires some space for a student to dramatize one use of water. Students should sit in a circle. Ask the students to think of some of the activities in their daily routine which require the use of water, for example; cleaning teeth, bathing, washing clothes, watering plants, etc.

Let each student, in turn, dramatize an activity involving the use of water, within a specified time. Only mime should be used, no speech. The other students can guess the use of water being portrayed.

Extension

Next, ask the students to recall one event that took place the previous day. Each student can say one sentence, beginning with 'Yesterday I....' The other students must think of ways in which water could be connected with the activity described in the sentence. For example the sentence may be 'Yesterday I received a letter.' In this case, the responses may be 'The letter came by sea mail' or The sender stuck the stamps on with water. 'The winning sentences are those which have nothing to do with water—but are there any such?

Recap and Discussion

Ask students to remember and list all uses of water as dramatized by the class. Put them all on the blackboard. Ask students to add more uses to the list. Review the list. Discuss how almost every activity that we do uses water, directly or indirectly.

Evaluation

What would happen if we do not get water at home for a day? Ask if students have faced a situation of water shortage (at home, school, while travelling etc). How did they manage?

Home Assignment

In addition to the water we use for our general everyday needs, different family members may use water for some specific use. For example, a grandmother may use water for taking medicine, and a brother may need water to give to his pet, etc.

Ask the students to list one such specific use of water by each member of the family.

Activity 3

Water for All

Objective	:	To become aware that a single water source is used by many living things.
Teaching Method	:	Observation, field visit
Teaching Aids	:	Notebook, pencils
Group Size	:	Individual
Duration	:	One day for observation, 30 minutes for discussion

Introduction

We have seen that the total amount of fresh, usable water is limited. But few of us are conscious of the number of demands on this limited amount of water. We may not even be conscious of the various things for which we use water, how many times in a day we use water or how much water we use.

Water is the best of all things.

Pindar (C. 522-C. 438 B.C.), Olympian Odes

The direct, personal uses of water are the first which come to mind when we talk about water uses—these may include drinking, bathing and washing. Then we may think of other obvious uses—water for agriculture and for power generation.

And it is not just human beings who need water. No animal or plant can survive without water. We may not always remember this, but man's overuse and misuse of water by humans may affect plant and animal life adversely.

How to Do?

Students should identify a common water source (small pond, tank or public water tap) near the school or in their community. They should observe the activities around the water source during the course of a day or a few days.

Students should note down all the activities such as washing, cleaning, bathing. They should consider not only human activity but also observe carefully how other living things—animals, birds, insects and plants—use the water source.

Students should also dig out some soil from one or more places around the water source. They should observe the various kinds of organisms that live in the soil—earthworms, insects, etc. They may use a magnifying glass for this.

They should make a detailed list of the different ways in which water is used. They could fill out a table similar to the one given here.

These lists should be put up in the classroom and discussed.

Source: Handpump **Location:** Corner of Road

Time	Who used	For what	Remarks
6.30 am	7 women from neighbourhood	Filling water pots	A lot of water went waste
7.00 am	2 workers	Drinking	
11.30 am	Some sparrows	Bathing in puddle	The patch around pump is very green
All the time	Grass	Growing	
All the time	Mosquito larvae	Observed in the puddle	Something needs to be done

If water consumption continues at the present rate, by 2025 two out of three people will not have enough water for their basic needs.

Recap and Discussion

What was the water source studied?

Was it a single source like a pond or lake, or multiple sources like a river and a riverside pool?

How many plants and animals were found in and around the water?

Will you agree after your observations that one source of water may be used by many living beings?

What will happen to all the plants and animals if the water source dries up?

Evaluation

The investigations carried out by each student may be used to understand if the student has understood that a single source of water is used by many living things.

Home Assignment

Ask students to find out what are all the other ways in which water is used at their home, in addition to use by the family members. They should list plants, animals and other living things in around their house that use the water sources around their house.

Activity 4

How Much Water Do We Use?

Objective	:	To estimate the amount of water that is consumed by a household.
Teaching Method	:	Audit
Teaching Aids	:	Writing material, used mineral water bottle
Group Size	:	Individual
Duration	:	One day for audit, 30 minutes for discussion

Introduction

We need water for routine daily activities like brushing our teeth, bathing, washing clothes. Many times we use water directly, other times water is required indirectly. How many of us stop to think how much water is used, by each of us, for these activities?

The recommended daily water requirement for sanitation, bathing, cooking and consumption is approximately 50 litres per person per day.

Measuring the water each of us uses daily helps to estimate water requirement per person per day.

The direct use of water can be measured by counting the number of glasses used for drinking, the number of mugs used for brushing teeth, and the number of buckets used for bathing, washing etc.

How to Do?

Ask students what are some ways in which we measure liquids?

Have a discussion on standard measures—tumblers for drinking water, buckets for taking bath, earthen or metal pots to store drinking water, mug for use in the bathrooms etc. Once they have an idea about the measures, ask them to calculate how much each of them uses in a day for personal uses like brushing, bathing, drinking, flushing the toilet, washing clothes, etc.

Tell them to keep a notebook and pencil handy and as they finish using water for any task, they have to immediately record how many measures were used. For instance, immediately after brushing, the student can note Brushing—2 mugs. If students directly use piped water, ask them to use a standardized measure for the purpose of this audit.

For a VI standard student, calibrating these measures with standard measures could be a little challenging. If facilitated by parents and teachers it could be done.

If doing this activity with older class children, do the calibration with them in the classroom itself. Use a measure of common capacity to calibrate. Examples of handy common measures include 300 ml cola or 1 litre packaged drinking water bottles.

For example, a standard packaged drinking water bottle measures 1000 ml or 1 litre.
If a small matka holds 10 bottles of water, this would indicate a capacity of 10 litres.
If 3 tumblers of water fills up a litre water bottle, then the tumbler measures around 330 ml each.
If a bucket holds 20 such mud pots it would have a capacity of 20 litres.

Once the students have calibrated their measures, let the class discuss their results with special reference to how correct such a calibration is. Would they be able to judge whether the vessel held exactly 4.5 measures, 4.35 or 4.6 measures? Can they think of any way to reduce these errors?

On average, women in Africa and Asia have to walk 3.7 miles to collect water. 18L can of water weighs 20 Kgs.

Once they have calibrated the containers as best as they can, let them keep a diary for three days to record water usage.

Date	Time	Use	How much	Conversion
12.12.10	6.00 am.	Cleaning teeth	2 mugs	1 mug = 425 ml Water used =2x 425 = 850 ml.
12.12.10	6.15 am.	Bath	1 bucket	1 bucket =11. 8 l Water used = 11. 8 l
12.12.10	11 .00 a.m.	Washing hand	1 mug	425 ml

Let each one calculate the average amount used for a day. (Total water used for 3 days / 3)

Recap and Discussion

Were the students surprised to discover how much water is being used in their house?

Did they find it difficult to measure and calculate? Did their family members help them in this activity?

Why is there a difference in the quantity of water used from person to person?

Evaluation

Ask student's to calculate how much water would be needed for one month and one year, based on their calculations. Each student should:

try to identify the causes of water wastage in his/her daily routine.

think of possible ways of saving water in his/her routine activities.

Home Assignment

Ask students to scan newspapers for news related to water supply, shortage, problems. Let them make a scrap book of the news items and pictures.

While implementing the Rural Water Supply Schemes, the following norms may be adopted for providing potable drinking water to the population:

40 litres per capita per day (lpcd) for humans to meet the following requirements:

Purpose	Quantity (lpcd)
Washing utensils and house	7
Cooking	5
Drinking	3
Bathing	15
Ablution	10

The average toilet uses 8 litres of clean water in a single flush.

UNIT PLAN Class: VII

Subject: Science and Social Sciences	**Unit:** Water—A precious resource
Duration 7 Class periods	**Concepts** • Distribution of water • Groundwater as an important source • Water wastage and judicious use • Harvesting rainwater • Importance of water for health and hygiene.

Instructional Objectives

Students will be able to :

- Visualize the proportionate distribution of water on earth.
- Comprehend that fresh water is a limited and scarce resource.
- Calculate how much is wasted through a dripping tap.
- Calculate the potential quantity of rain water that can be harvested.
- Understand how water infiltrates into the soil and groundwater gets recharged.
- Demonstrate why hand washing is important for health and hygiene.

Previous Knowledge	Teaching Points
• Water is essential for life • Water has a number of demands • Water shortage is a problem in many cities and towns due to a variety of reasons/activities • Living things cannot survive without water.	• Where all is water found on earth? Where do we get our water from? • How is water knowingly and unknowingly wasted in our daily life? • How is water stored underground? • How much water can be harvested from rainfall? • How can rainwater be used to recharge ground water?

Teaching and Learning Activities

Activity 1

How Much Water is Available?

Objective	:	To demonstrate the distribution of water on earth and how much of it is actually available for direct use.
Teaching Method	:	Demonstration and discussion
Teaching Aids	:	Large container (2.5 l), small transparent container, two small dishes, measuring cylinder, teaspoon, ink-dropper.
Group Size	:	Entire Class
Duration	:	30 minutes

Introduction

The world's water resources seem enormous—nearly three-fourths of the earth's surface is covered by water. But not all this water is available for our use. Ninety-seven per cent of this water resource is in the oceans and is salty. The glaciers and ice-caps lock away another two per cent. Even less than one per cent is the fresh and usable water of lakes, ponds, rivers and groundwater.

Where is the usable water and how do we get it? Approximately one per cent of the water on Earth is fresh water and is available for our use from three sources:

(I) Groundwater (ii) Freshwater lakes (iii) Rivers.

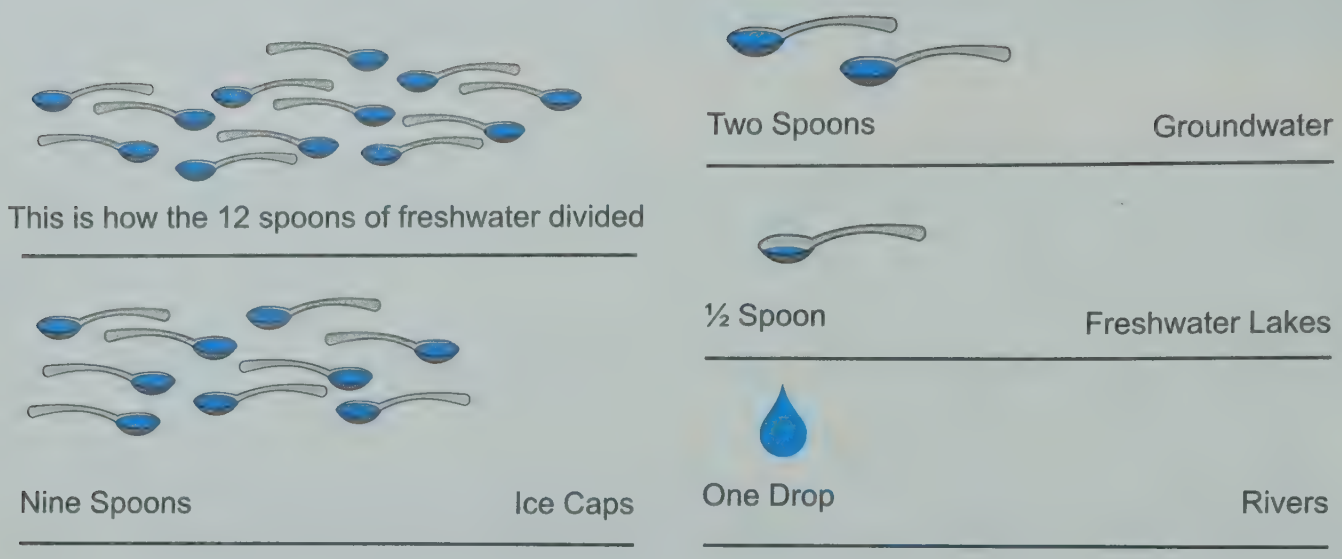
Distribution of water on earth in per cent	
Oceans	97.2
Ice-caps	02.0
Groundwater	00.62
Freshwater lakes	00.009
Inland seas and Salt lakes	00.008
Atmosphere	00.001
Rivers	00.0001
Total	**99.8381**

Drawing mainly from these three sources, most living creatures have to satisfy their needs.

Animals, birds and insects mainly depend on surface water sources such as rivers and lakes. Plants generally make use of groundwater.

Human beings draw upon both surface water and groundwater. Through the use of technology, they can divert rivers, build dams and sink wells to make use more of this fresh

Availability of water in India is highly uneven in both space and time. Precipitation is confined to only about three or four months in a year and varies from 100 mm in the western parts of Rajasthan to over 10000 mm in Meghalaya.



water available. But in spite of all this technology, the fact remains that the total quantity of fresh water available is limited.

How to Do?

Ask a student volunteer to measure and bring 2200 ml of water in a small bucket or container using a measuring cylinder or any container or bottle of known measure, eg. A soft drink bottle or a mineral water bottle.

Start the demonstration.

Tell them to assume that 2200 ml represents the total water available on earth.

Take a teaspoon and measure out 12 spoons of water into a small transparent container. Tell them that this is the total amount of freshwater on earth, including the water found in lakes, rivers, ice-caps, and as groundwater.

The water that remains in the large container represents salty water found in oceans and seas.

From the container with 12 spoons of water, let students measure out two spoonfuls into a dish. This represents the groundwater.

Let the students take another dish and remove into it half-a-spoon of water from the container which now has 10 spoonfuls of water. This represents the water found on the surface of the earth in freshwater lakes.

From the remaining water in the smaller container, let students remove one drop using an ink-dropper. This drop represents the amount of water found in rivers. The smaller container will now have about nine spoons of water left in it. Tell the students that this represents the amount stored in ice-caps.

Ask the students to compare the quantities of water in the various containers.

Observe students' reaction.

Recap and Discussion

- What per cent of water found on earth is freshwater?
- Which source is the largest reserve for freshwater?
- What are the limitations in using water stored in the ice caps?
- Why is it important to conserve water?
- What are the ways in which freshwater is wasted?
- How can freshwater be conserved?
- How can we protect surface and groundwater so that it is available for our activities.

Evaluation

Ask the students to write a letter to a friend explaining what they have learnt through this demonstration.

Home Assignment

Ask students to carry out the demonstration in the family and in the neighbourhood. Ask students to share the responses obtained after performing this activity.

Activity 2

Where Does our Water Come from?

Objective	:	To identify the source of the water used in our homes. To understand that provision of water is an important service provided by the government. To understand that water is becoming a commercial product
Teaching Method	:	Observation/interview/research
Teaching Aids	:	Writing material
Group Size	:	Individual
Duration	:	One day for survey, 30 minutes in class

For many of us, water simply flows from a tap, and we think little about it beyond this point of contact. We have lost a sense of respect for the wild river, for the complex workings of a wetland, for the intricate web of life that water supports.
Sandra Postel

Introduction

Rivers are the source of water to many cities, though they are not situated along side a river. In case of some cities water from the ground is used. Water from distant sources are pumped and transported in larger pipes over great distances.

For many people in towns and cities water is easily available in the sinks and bathrooms of their homes. But, not so long ago people fetched water from a common source like ponds, wells, streams, hand pumps and public taps in pitchers and pails. With technology, access to water has been easy and there has been a manifold increase in water use.

How to Do?

Ask each student to find out from parents and others in the neighbourhood from where they get their drinking water and water for other domestic uses.

Is there a direct connection of water supply to the house?

Is there running water at all times of the day or does it come only at fixed times?

What is the source—borewell, river, lakes etc

How far is the source?

How is it supplied?

Is it treated before the supply?

Do you have to buy drinking water in bottles? Find out the source of the bottled water, procedures to purify and market it, the price of the water, etc.

Many of us also get water sources like open wells and bore wells. Ask them to find out who got the wells dug, who maintains them, how many people use water from the source, etc.

Also help students find out the amount of water tax and other taxes paid to the municipal authorities. Water tax is for supplying drinking water to homes. Municipalities also collect some amount for maintaining sewage drains and treatment of sewage.

Recap and Discussion

Based on the information obtained by the students and you, discuss the different aspects of water availability and supply. The points below will help you to guide the discussion.

Water is available in our home because someone fetches it for us, is provided by the municipality or the panchayat. The role of local authority in providing water to the residents—includes supply costs, maintenance costs, etc.

How is the water stored at home—in overhead tanks, in water drums and pots, buckets, etc.

Why do you think, people now a days need to buy drinking water in big bottles and pouches?

Evaluation

Imagine that you are going to meet the person from society/panchayat/municipality who is the in-charge of the water supply. What are the questions the students will ask this person?

The human right to water entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses.

Home Assignment

Is there a well or bore well where you live? Was it made by the municipality/panchayat, housing society or by your own family? Is the water pumped from the well to a common tank? Who pays for the electricity charges for pumping up the water to your society or colony?

Find out if your family any charges for water supply to the municipality/panchayat/society. What are the charges for and how much is it?

Activity 3

Aquifers and Wells

Objective	:	To demonstrate how rainwater percolates through the soil and rises in the wells through a model.
Teaching Method	:	Model making and demonstration
Teaching Aids	:	Empty aquarium container, clayey soil, stones, pebbles, fine sand, loose soil, drinking straws, mug, marking pen.
Group Size	:	Entire class
Duration	:	60 minutes

Introduction

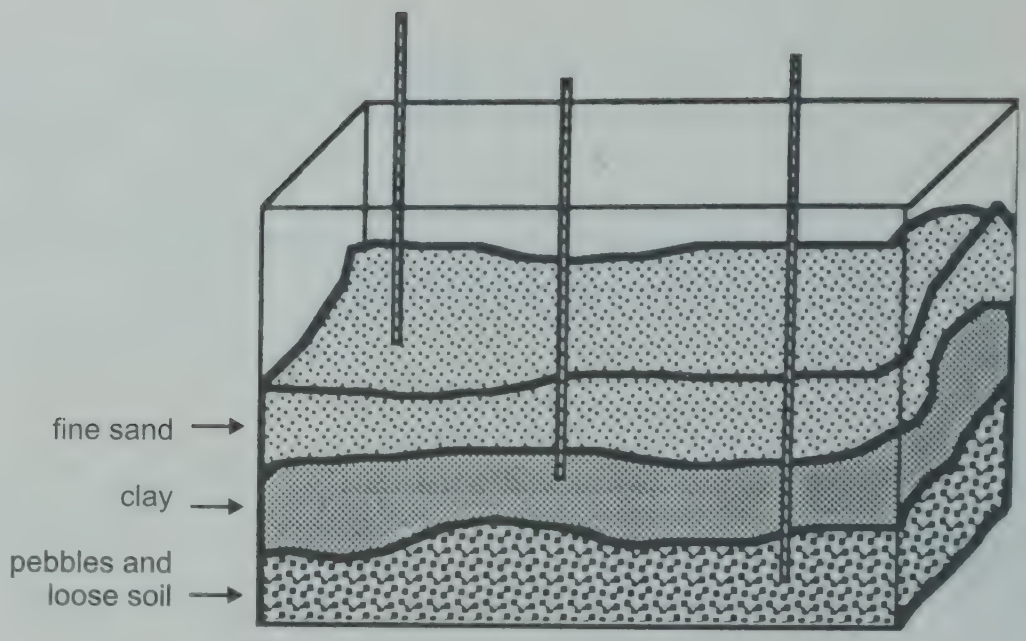
Much of the freshwater on land is hidden underground in vast reservoirs collectively called groundwater, it is this groundwater that supplies water to wells, springs and even to rivers and streams. Water from rain as well as some of the water from lakes and rivers infiltrates into the ground and goes down until it encounters solid rock. The process by which rain replenishes the ground water supply is known as recharge. The sub-surface zone that in which the water collects and from which it is drawn through wells is called an aquifer. The top of this zone of water is called the water table.

If the water that is drawn from the aquifer is more than the water which recharges it, the stored water will be depleted. This leads to serious shortages of water for drinking, domestic and irrigation purposes.

Water is being depleted many, many times faster than nature can replenish it.

How to Do?

Take an empty aquarium container. Line the bottom of the container with a 5 cm layer of pebbles, stones and loose soil. Mark the top portion with a few drinking straws of one colour and insert them into this layer.



Over this layer, let the students form a 5 cm layer of dry and loose clayey soil. A few straws marked with another colour should be inserted into the layer of the clayey soil. The topmost layer is to be a 5 cm layer of fine sand. Some more straws marked with a different colour should be put into the sandy layer (see figure).

Tell the students that the straws represent wells. Let the students pour water gently, a little at a time, along the walls of the aquarium, without disturbing the soil layers. Let them continue, until the water has percolated through to the bottom layer. Let the students find out which of the straws get water first and which last. One way to do this is to put a thin dry stick in each straw and measure the wet part. How does the water that reaches the stones and pebble layer appear?

Recap and Discussion

How the groundwater in aquifers is a natural reservoir in which water is collects during rainy season and can be used during the dry months. Discuss how due to the over extraction of this water by deepening tube wells, this stored water is being exhausted.

Ask if students know of places where wells have run dry or tube wells have been deepened.

Evaluation

Not all places we live have a river, lake or pond to provide freshwater. In such places groundwater provides all the water required.

Ask students to comment on this statement, 'It is important that ground water should not get depleted'.

Home Assignment

Find out if there is a bore well in the neighbourhood and whether it has been deepened in the last 2-3 years.

When the well is dry, we learn the worth of water.

Benjamin Franklin

Activity 4

Dripping Tap

Objective	:	To explain how a large quantity of water gets wasted through leaking taps.
Teaching Method	:	Experiment
Teaching Aids	:	Measuring cylinder or empty soft drink bottle of known volume, stopwatch or 'minute' glass, a tap or a large bucket with an attached tap, a bucket.
Group Size	:	Entire class
Duration	:	30 minutes

Introduction

As human population increases, so does the demand for water. Change in lifestyles—for example, increasing use of gadgets like washing machines, as well as changes in agricultural and industrial activities is putting enormous pressure on our water resources.

Large quantities of water gets wasted from our homes, schools, offices etc. due to our negligence.

The amount of water available on earth is constant. So it is important that we use this precious resource wisely.

How to Do?

Ask students to gather around a water tap. Place a bucket under the tap and adjust the tap so that the water drips, drop by drop.

Let one student take charge of the stopwatch or minute glass and be the time keeper. Ask another student to hold a measuring cylinder under the dripping tap.

As soon as the time keeper gives a signal at the end of one minute, the cylinder should be removed from under the tap. The water collected in the cylinder should be measured.

Based on the amount of water collected in one minute, ask students to calculate the amount of water that would be wasted in one hour, or in a day from a dripping tap.

Further discuss with students the most common causes of water wastage in our homes, schools,

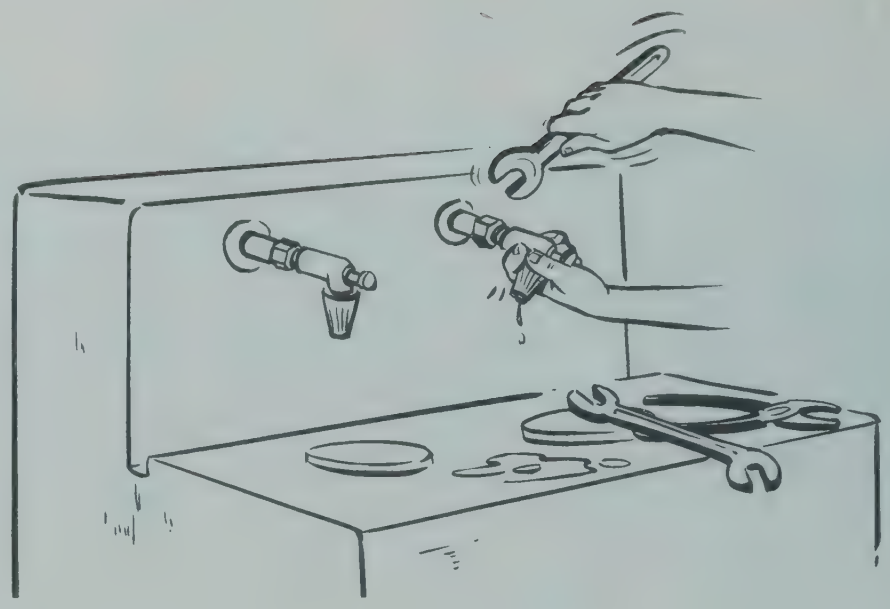
Stop the drip to save the drop.

offices, etc., and on methods of preventing water wastage.

How much water would drip away in one hour?

For example, if 50 ml was wasted in one minute,
3000 ml or 3 litres (50 ml x 60 minutes) would be wasted in one hour.

The water that would be wasted in one day will be
3000 ml x 24 hours = 72,000 ml or 72 litres.



All this from one single dripping tap, in just one day!

Recap and Discussion

Why do you think that most people do not repair their tap if it is leaking, or do not turn off the tap after use?

What will you do if you see a leaking tap?

Evaluation

Ask students to calculate how much water they use for their personal every day use—brushing, bathing, washing etc. They should compare this with the amount of water a dripping taps wastes in a day.

Home Assignment

Students should observe how many taps are dripping at home and how much water gets wasted in this way.

Ask students to learn how to fix a tap from their family, neighbours or friends, and demonstrate it in the school.

Activity 5

The Rain on Our Roofs

Objective	:	To appreciate the potential of rainwater harvesting to help mitigate water shortage problems.
Teaching Method	:	Estimation and quantification
Teaching Aids	:	Writing material, table of rainfall data.
Group Size	:	Entire class
Duration	:	30 minutes

Introduction

Rooftop water harvesting is a method of collecting and storing rainwater which falls on the roofs of houses and other buildings. The water collected from a roof is of good quality. It can be stored in tanks/sumps, either for direct use or can be diverted to an existing bore well/open well/ percolation pit for groundwater recharge.

Rainwater is a pure form of water and when added to the relatively poor quality of groundwater, in some places, the quality of that water will improve due to dilution. Rainwater harvesting replenishes groundwater table. It avoids subsidence and salt water intrusion in coastal areas, makes dug wells and bore wells sustainable. Flooding of low lying areas during rains can be avoided to a large extent.

How to Do?

Ask students to measure the length and breadth of the school roof (or roof of any building accessible for use).

Using the measurements, calculate the area of the roof.

Area of roof = length x breadth (measured in metres)

Find the average rainfall that the city/town/village receives annually (in millimetres). If this data is not available refer to the table given to carry out this activity.

Volume of rainfall that can be collected over the roof =

Area of roof x Average rainfall

(Average quantity of rainfall in metres: Average rainfall in mm/1000)

All the rain that falls on the roof cannot be collected due to seepage or spillage. Therefore, it is normally assumed that about 40 per cent of the rain goes waste and about 60 per cent of it can be effectively harvested.

India has the second highest average annual rainfall in the world, but we still face water shortages.

Volume of the water harvested= Volume of rainfall x 0.6. Help students calculate the amount of rain that can be harvested from the school and home roof.

Recap and Discussion

Discuss with students some of the other advantages and benefits of harvesting rainwater.

Evaluation

Find out where the rain water in the school goes. Draw the path on paper on the ground.

Home Assignment

Find out from your elders how they stored water in the earlier times.

Find if your area has any traditional water conservation systems/structures (stepwells, bunds, tanks).

Calculate the area of the roof at home and based on that, calculate the amount of rain that can be harvested.

Considering the average water requirement as 10 litres for drinking and cooking, let the students find out the amount of water harvested would serve their family for how many days.

Mean Rainfall for the Month of July

	Name of the station	Mean rainfall (in mm)
1.	Agra	203.3
2.	Bhuj (Rudramata)	125.7
3.	Bhopal (Bairagarh)	354.1
4.	Cherrapunji	2622.0
5.	Dibrugarh/Mohanbari	520.9
6.	Hassan	147.9
7.	Indore	283.7
8.	Kozhikode (A)	789.3
9.	Minicopy	245.2
10.	Patna (A)	319.2
11.	Raipur	369.1
12.	Surat	440.8
13.	Thiruvananthapuram	218.6
14.	Vijayawada	173.0
15.	Panjim	949.5

Activity 6

How Clean are My Hands?

Objective	:	To demonstrate that hand washing is an important personal hygiene habit.
Teaching Method	:	Demonstration and discussion
Teaching Aids	:	3 glass tumblers or three clean transparent plastic bottles, a bowl, a small bucket of clean water, a mug or extra glass.
Group Size	:	Entire class
Duration	:	30 minutes

Introduction

While we go about doing all our daily chores using our hands, seldom do we realize that hands are one of the most common routes through which many diseases spread. And the simple act of personal hygiene: handwashing with soap is a way to prevent spread of diseases. Handwashing is an important aspect of personal hygiene that needs to be inculcated in every student because it also plays an important role in the use and protection of water, and food hygiene.

How to Do?

Take three tumblers and put them on a table where the entire class can see. Fill one tumbler with water.

Ask one of the students to help another student to wash his/her hands in a clean bowl.

Pour out the water in this bowl into the second tumbler. Rinse the bowl and drain it dry.

Compare the water in the first tumbler with the one in the second tumbler. Can the students see any difference in the colour of the water?

Let the class go back to doing its regular activities, and after about 15 minutes, let the same student who volunteered to wash his/her hand come over and wash hands again in the bowl. Pour the water in the bowl into the third tumbler. Compare the three. Does the water in the third tumbler look different from water in the first and second tumblers? Why does the water appear dirty even though the student washed his hands just about 15 minutes ago?

Simply washing hands can decrease the chance of diarrhoea by around 35 per cent.

Note: There is a possibility that students may shy away from volunteering to wash the hands in front of the entire class as it would reflect on their cleanliness. It may even affect their esteem. In such a situation do not force anyone. You may have to demonstrate it yourself! If you want your class to try it out, ask them to do it in their homes and carry on with the discussion next day. Ask if they agree that hands could get dirty quickly and therefore need to be washed before any important task is to be done, especially before eating.

Recap and Discussion

Discuss how hands get dirty because dust and dirt gets onto our palms. Our palms sweat and this helps the dirt to stick to our hands. We use our hands to touch and handle many things. These things might carry dust and germs which can stick to our hands. However, we cannot see that and our hands don't look dirty. Discuss also how these invisible germs can cause many illnesses.

- Ask students to make a list of all the things that they may be touching in the course of a day, from the time they get up till they sleep. Discuss how hands can get dirty by this.
- Ask students to check each others' nails and see if they are long, or have dirt underneath the nails.
- Emphasize that it is most important to wash hands especially after using toilet and before eating.

Evaluation

Ask students to brainstorm on possible reasons or situations in which hand washing is ignored. Students can suggest ways by which to remember, or remind others to wash hands. This is an appropriate time to find out why people generally ignore to wash hands.

Home Assignment

Ask students to carry out the same activity at home. Ask them to share the experience in the classroom.

UNIT PLAN: Class VIII

Subject: Science and Social Sciences	**Unit:** Water—A precious resource
Duration 5 class periods	**Concepts** • Distribution of water • Various activities pollute water--directly and indirectly • Quality of water • Pollution affects water quality • Polluted water impacts human health.

Instructional Objectives

Students will be able to :

- Identify and classify the direct and indirect sources of water pollution
- Understand the reason behind eutrophication of lakes and other water bodies
- Identify and make an inventory of detergents used at home
- Carry out simple tests to determine water quality.

Previous Knowledge	Teaching Points
• Water is used for many activities • Water gets dirty due to many of the day to day activities carried out by us. • Dirty or polluted water cannot be directly put to use. • We should not use dirty water for consumption because we will fall sick. • Handwashing and bathing as important personal hygiene habits.	• What are the various sources—direct and indirect–through which water gets polluted? • How are households the sources for many pollutants? • What parameters can be used to determine water quality? • How has quality a bearing on the health of people?

Teaching and Learning Activities

Activity 1

Direct and Indirect Sources of Pollution

Objective	:	To list major types and sources of water pollution, and classify these as Point and Non-Point Sources of pollution.
Teaching Method	:	Classifying and Tracking
Teaching Aids	:	Chart paper, sketch pens to prepare the 'Pollution list', observation notebooks.
Group Size	:	Entire Class
Duration	:	30 minutes

Introduction

Water is said to be polluted when certain substances are introduced in such large quantities that its natural quality is affected. Polluted water affects the health of the plants and animals that live in it, or depend on it.

Water gets polluted due to different types of wastes which are disposed from human settlements, industries and agriculture, and also by natural sources such as soil, plant and animal debris after a heavy rainfall.

The pollutants reach the water in many ways. A pipe from an industrial plant or a sewage treatment plant may drain directly into a water body. These sources of pollution which can be easily identified and managed area described as **point sources**.

Water pollution can also be caused indirectly. For example, water that drains from fields, gardens and streets which are located quite far from the water body may carry sewage, chemical pesticides or fertilizers which can pollute the water. These sources which are spread out and which may not lead directly into the water body are described as **non-point sources.**

How to Do?

Ask students to list what they use water for (drinking, cleaning, washing, bathing, etc).

Water and air, the two essentials on which all life depends, have become global garbage cans. — *Jacques Cousteau*

Then ask them what happens to the used water that drains out from the bathrooms and kitchen? What happens to the water used in hotels, hospitals, factories and industries? Where does wastewater of their village/town/city go?

Explain that most of us generally do not think about where this used water goes, or what its impact on the environment could be.

Explain to students that usually, waste water from homes, hospitals, schools, hotels, factories; industries, etc. is discharged either after treating it or directly into the nearest water body such as lake, river, sea, etc. Sewage ending up in water bodies is one of the ways in which water gets polluted. Thus water gets polluted from both point and non-point sources.

Now, write down the 'Pollution List' given on the next page on the blackboard.

Ask students to classify the sources given in the list as Point (PS) or Non Point (NPS).

Recap and Discussion

Why is it important be aware of pollutants as point or non-point?

Discuss the implications of such point source or non-point source. Which do they think is easier to locate and control—a point source or a non-point source of pollution? Why?

Evaluation

Ask students to add examples of pollution sources that they have observed in their surroundings, to the list.

Ask students to suggest ways in which Point and Non-Point sources of pollution can be prevented.

Home Assignment

Let students find out what is the system of sewage disposal from their house and neighbourhood. Where is the sewage disposed?

If there is any water body in the neighbourhood (a small pond, stream, river, etc.) students should observe it carefully and list possible activities around the water body (bathing, washing clothes) garbage dumping, pipes discharging in to the water, etc. which can pollute the water.

All the water that will ever be is, right now.

National Geographic

Pollution List

Sources of Pollution	Type
Factory discharge pipe	
Runoff entering rivers	
Oil spill from a ship	
Nuclear power plant water canal	
Air pollution settling on water	
Garbage dump located near a stream	
Washing animals along the pond	
Sewage from cities	
Runoff water	
Sewage effluent treatment plant	
Agricultural fields	
Animal farms	
Streets and roads	
Lawns (fertilizers and pesticides are used to maintain lawns)	
Open defecation	
Sewage discharge pipes	
Septic tanks	
Water from aquaculture ponds	
Vehicles	
Soil carried away from exposed areas	
Animal waste from streets	
Run off water from buildings, streets, pet droppings and litter	
Construction debris	
Mining	

Activity 2

Water Testing

Objective	:	To observe and record different indicators of water for assessing the quality of water
Teaching Method	:	Experiments
Teaching Aids	:	10-12 containers of approximately one litre capacity for collecting water, 3-4 sheets of white paper, piece of white muslin, blue and red litmus papers, handful of soap powder, five glass beakers, a burner of stove.
Group Size	:	Groups of 4-5
Duration	:	One day for sample collection, 30 minutes for experiments

Introduction

'Clean water', 'pure water', 'clear water' are some of the terms we use in describing water of good quality. But what do they mean?

There is no way to avoid pollution entirely as many things that people do cause pollution. Household and industrial wastes, pesticides and fertilizers, and sewage are some sources of water pollution. So are surface mining and construction practices.

Fish, plants and other organisms that live in water cannot survive without the dissolved oxygen in the water. But when water gets polluted, most of the dissolved oxygen is used in the decay of the wastes in the water. Thus, as the pollutants in water increase, dissolved oxygen decreases and this reduces plant and animal life in water.

Some simple tests can help to detect pollution of water.

How to Do?

Divide the class into several groups. Let the students collect water from different water sources. Some examples are:

Rainwater

Water from the sea

Lack of access to clean water and sanitation has claimed more lives through disease than any war through guns.

Tap water
Water from a stagnant pond
Water from a stream
Water from a river in the city
Water from well
Water from a river in the village

All the samples should be collected on the same day. Each sample should be accompanied by a brief description of the source from which it was taken. Students should collect each sample in a separate, transparent container and label it.

Let the students bring the water samples to the classroom. They should display the samples with a description of the source of each.

Now ask each group of students to carry out the following experiments with each sample of water and to note down their observations and results. A sample of distilled water should be kept as a control (with which other samples can be compared).

1. **Colour**: The students should observe the colour of the water in the transparent container against a white background.
2. **Odour**: Does the water smell pungent, of rotten eggs, of rotten or decaying vegetables, or is it odourless?
3. **Turbidity**: The water should be observed against a white background to see whether it is clear or not.
4. **Presence of suspended solid particles**: Let the students filter the water through a clean white muslin cloth to check for any residue left on the cloth.
5. **Presence of dissolved particles**: Let the students evaporate 100 ml to 250 ml of water in a clean, transparent container to check for any residue left behind in the container.
6. **Acidic, alkaline or neutral**: Let the students use litmus paper to check whether the water is acidic, alkaline or neutral. A change in the colour of the litmus paper from red to blue - indicates alkalinity; from blue to red indicates acidity; absence of change in colour indicates that the water sample is neutral.
7. **Presence of dissolved air in the water**: Let the students warm 100 to 250 ml of water in a clean transparent container. The water should be warmed below its boiling point to check for the presence of dissolved air bubbles adhering to the sides of the container.
8. **Hard or soft water**: Let the students take about 100 ml of water and put some soap powder into it. Let them observe and see if it gives lather easily with soap. If it does then the water is soft.

When drinking water, remember its source.

Chinese Proverb

Students should record their observations in the common table given below.

Source	Odour	Colour	Turbidity	Solid particles present	Dissolved particles present	Acidic/ alkaline/ neutral	Dissolved air present	Hard or soft

Recap and Discussion

Why is it important to find out the quality of water?

What parameters did the tests carried out in this experiment help the students to find out. (some physical and chemical parameters)

Suppose there was a sample of water from a pond in the locality which looked and smelt clean would the students agree that it was potable? Ask them why it may not be suitable for human consumption? Water that looks clean may contain microorganisms (that can cause diseases like cholera, typhoid and jaundice), heavy metals, etc. and need to be treated further to make it suitable for drinking.

Evaluation

Let the students compare their observations and results obtained from the experiments with various samples of water. Based on this, ask the students to differentiate between the different types of water collected from various sources.

Now ask the students to briefly describe the quality of the water from the various sources and the possible uses of each quality of water. An example is given below.

Source	Water quality	Uses
1.Distilled water	Pure water (H_2O)	Used in industrial chemical processes
2.Tap water	Clear water	Domestic purposes.

Home Assignment

The students could visit a local water source such as a lake or a river. They should describe the water source, the life around the water source, the activities around the water source, the various uses of the water from the source and the kinds of pollutants that may affect the water quality.

Water is H_2O, Hydrogen two parts, and oxygen one; but there is also a third thing, that makes it water and nobody knows what that is.

D.H. Lawrence

Activity 3

Water and Health Audit

Objective	:	To understand that water is the cause of some of the most common illnesses.
Teaching Method	:	Audit
Teaching Aids	:	Writing material
Group Size	:	Entire Class
Duration	:	30 minutes for audit, 30 minutes for tabulation and discussion

Introduction

The waste from urban areas is usually drained into water bodies from which drinking water supply is taken. Ideally, this sewage should be treated before being drained into the waterbed, but we do not have adequate treatment systems to handle the large quantities of wastes produced.

Untreated sewage introduces many disease-causing organisms into the waterbed. When this is the source of drinking water, this may cause serious health problems, some of which may even be fatal. Some of the diseases caused by drinking such water are cholera, gastroenteritis, typhoid and jaundice. (Refer Table 'Waterborne diseases and their Symptoms'.

Water pollution is mainly due to sewage and industrial wastes. Having a proper sewage treatment system and treatment of industrial effluents before they are discharged into a waterbed are a few of the steps that can be taken to reduce this.

How to Do?

Let the students do a Health Audit of their class. Ask them to look into the attendance register of the class and find out how many classmates were absent in the last 4-6 months.

Ask the absentees to recollect why they could not attend school. They would find that many could not attend school as they were unwell. Take note of what they were suffering from. (e.g., cold and cough, stomach problem, fever, etc.)

An audit is the systematic collection and analysis of information to evaluate the situation and identify existing problems. It is the backbone for planning actions required to deal with problems associated with a system or an issue.

Tabulate the information. A table like the one given below could be used.

Name of the absentee student	No. of days absent	Month	Illness	Possible reason for contracting the illness

Let them analyse how many of them suffered from waterborne diseases (cholera, typhoid, dysentery, diarrhoea, jaundice, etc)/ vector borne diseases like malaria, dengue, chikun gunya, etc. Let them observe if there is any seasonal link to occurrence of diseases?

Ask students to make a general list of 'do's and don'ts' that should be followed to ward off such diseases. Ask them to share it with their family and friends. Put this up on their class notice board.

Recap and Discussion

Invite a doctor or public health specialist (it could be a parent) to talk to the students about these issues

Evaluation

Ask students to give suggestions on how we can prevent water borne diseases. Encourage students to consider the following while giving their suggestions.

Quality of water source

Water storage

Water dispensing

Water stagnation

Home Assignment

How is drinking water stored in your school and home? Is there any chance that the water can be contaminated?

Find out if there are any stagnant pools around your house? Can you do something to prevent these?

How are you preventing breeding of mosquitoes in your home?

In India alone, water-borne diseases cost the economy 73 million working days per year.

Waterborne Diseases and their Symptoms

Type of Organism	Disease	Symptoms
Bacteria	Typhoid, Cholera, Bacterial dysentery, Enteritis	Diarrhoea, severe vomiting, enlarged spleen, inflamed intestine; often fatal if untreated. Diarrhoea, severe vomiting, dehydration, often fatal if untreated. Diarrhoea, fatal in infants without proper treatment. Severe stomach pain, nausea, vomiting; rarely fatal.
Virus	Infectious hepatitis	Fever, severe headache, loss of appetite, abdominal pain, jaundice, enlarged liver, rarely fatal but may cause permanent liver damage.
Parasitic protozoa	Amoebic dysentery, Giardia	Severe diarrhoea, headache, abdominal pain, chills, fever. If not treated can cause liver abscess, bowel perforation, and death. Diarrhoea, abdominal cramps, flatulence, belching, fatigue.
Parasitic worms	Schistosomiasis	Abdominal pain, skin rash, anaemia, chronic fatigue, and chronic general ill health.

UNIT PLAN: Class VI

Subject: Science	Unit: Energy
Duration 5 Class periods	**Concepts** • Energy as an input to get work done • Energy sources • Energy uses

Instructional Objectives

Students will be able to :

- Relate energy use with their physical activities.
- Identify the sources of energy and classify the energy sources for daily activities.
- Identify the different uses of energy.

Previous Knowledge	Teaching Points
• Energy is required in our daily life • There are various energy sources—renewable and non-renewable	• What all do we need energy for? • Why is energy important? • What are the sources of energy used for various purposes? • What happens when there is no energy?

Teaching and Learning Activities

Activity 1

Energy for Work

Objective	:	To understand the link between food and energy and work in human and animals.
Teaching Method	:	Demonstration, discussion
Teaching Aids	:	None
Group Size	:	Entire class
Duration	:	30 minutes

Introduction

What exactly is energy? It is not a thing that you can touch. But it is certainly there. How do we know? We can see what it does. Energy makes things happen. In the case of humans and animals energy provides the capacity or ability to do work. Food is the main source of energy that fuels our bodies, helping us to grow, run, talk and think. It is one of our most important sources of energy.

How to Do?

Ask the students to name animals that work for human beings.

Using both human and animal examples discuss the link between food, energy and work. Some examples are given here:

- Drawing water from the well
- Digging pits
- Lifting headloads
- Carts drawn by animals (camels, bullocks, donkeys and so on)
- Animals used in tilling and other agricultural operations like drawing water,
- Animal power used in oil mills etc.

Discuss with the students the concept of work. In the technical sense "to do work" means

Energy cannot be created or destroyed; it can only be changed from one form to another.

moving something against a resisting force. Tell them that objects at rest remain at rest and tend to remain so unless force (energy) is applied to move them.

Ask the students in the class to lift or push several objects, say books pencils, stones, chairs etc. Make them understand that in all these lifting and pushing activities work was done, and the force (energy) to do the work was provided from their muscles. Ask them where they got this energy from. Lead them to make the link between the food they eat, and the energy they get from it.

Recap and Discussion

Ask students what they think about when they hear the word "energy". Write down their answers. Many students may think in human terms "I don't have much energy today". Explain that scientists define energy as the cause of all activity, or the ability to do work.

Evaluation

Ask the students to tell what is the source of energy for a cow, a goat, a tiger, a fly, a honeybee, a fish? Why do these animals need energy?

Home Assignment

Ask students to bring pictures, photographs from newspapers, magazines etc. depicting work being done either by machines or people. Try to analyse the source of energy which is doing the work you may organise an exhibition.

Activity 2

Energy for What, and from Where?

Objective	:	To identify, and understand that most of the activities in our daily life require energy.
Teaching Method	:	Review and Analysis
Teaching Aids	:	Writing material
Group Size	:	Entire class
Duration	:	30 minutes

Every action in the universe involves energy.

Introduction

Energy powers our lives every moment. It is at work within our body and outside it. Take for instance a walk at the beach on a summer evening, we can walk because of the energy we get from food which fuels the different processes in our body. At the surface of the skin, the cool breeze can be felt, this is because the energy in the wind carries it from far away places to us. The breeze in effect cools our body, releasing heat from the body. Our existence thus depends on the interplay between different forms of energy either direct eg. From the sun or indirect, cooking gas, wood, and dung cakes that help heat and cooks food.

How to Do?

Ask students to list all the routine and other activities that each of them did the previous day.

In their notebooks ask them to make a table with three columns to fill up the details. In the first column ask them to put down the type of activity they undertook.

In the second column of the table, ask them to indicate for what aspect of that particular activity energy is required.

In the third column, they can indicate the energy source that was utilized.

While listing, ask students to draw out the link to energy use in that particular activity. E.g. while energy use is obvious in activities like watching TV or using a stove, it may not be so in case of drying clothes or reading a book.

Activity	Energy is required...	It came from...
Had Breakfast	To cook, refrigerate, use kitchen appliances	Electricity, cooking gas
Washed clothes	To run machine, pump water, to dry clothes	Electricity
Came to school	To run bus to reach school	Diesel/Fossil fuel
Went to park to play	In walking, running, playing	Food
Read a story book	To power the lamp/fans used while reading	Electricity
Watched TV	To operate TV, to operate the remote control	Electricity, Dry Battery cells

List out all the sources on the blackboard and classify them.

Recap and Discussion

While energy use is obvious in activities like watching TV or using the stove, it may not be so obvious in the case of drying clothes or reading a book. Discuss and list the services that energy provides directly or indirectly. For example, transportation, lighting, heating, cooking, entertainment, running home appliances, etc.

Renewable energy provides national energy security at a time when decreasing global reserves of fossil fuels threatens the long-term sustainability of the Indian economy. India Energy Portal

Evaluation

Ask students to note their own table and find out which source of energy is most used by their daily activities, and which is the least used?

Home Assignment

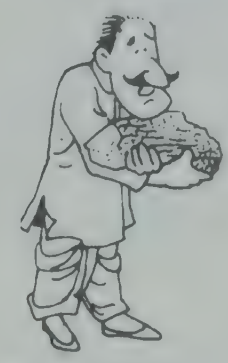
Ask students to observe the different activities at their home, and to note down 3 activities that:

- use energy from the sun
- use electricity
- use fuel (LPG, fuelwood, charcoal, etc.)

Energy can be stored in six forms:

1. **Radiant energy:** energy that travels in waves such as light, radio waves and x-rays.
2. **Thermal energy:** heat energy is a type of kinetic energy, the energy of moving and vibrating molecules.
3. **Chemical energy:** the energy that bonds molecules together
4. **Mechanical energy:** the energy of motion (kinetic) and the energy of position (potential)
5. **Nuclear energy:** the energy locked in the nuclei of atoms
6. **Electrical energy:** a kind of kinetic energy-the energy of moving electron

Mechanical Energy



Potential Energy

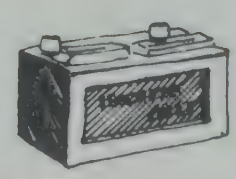
Kinetic Energy

Chemical Energy

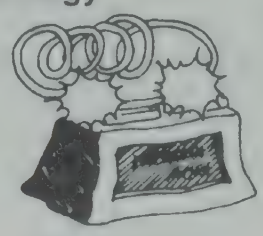
Potential Energy

Kinetic Energy

Electrical Energy



Potential Energy



Kinetic Energy

Coal is one of the primary sources of energy. India has some of the largest reserves of coal in the world.

Activity 3

Sources of Energy

Objective	:	To learn about various sources of energy used in our daily life.
Teaching Method	:	Question-answer, discussion
Teaching Aids	:	Paper, pencil
Group Size	:	2 to 3 students
Duration	:	30 - 40 minutes

Introduction

Energy is all around us: In sunlight, wind and water; in green plants and food grains; in certain products obtained from the soil and sea bed; in radioactive minerals. We need energy to grow, and to do our work, to grow our food, to cook it, to keep us warm, to give us light and move us from one place to another; to produce various things like cars and clothes etc. Everything we do is connected with energy in one form or another.

How to do?

Write down the questions given here on the blackboard. Ask every students to write down 'what happens' in 3 lines each.

What would happen if:

- We do not take food for two days?
- There was no electricity?
- There was no petrol or diesel in the car?
- There was no sunlight?
- There was no firewood
- There was no wind?

After every one has finished ask students to tell what they have written. Build the discussion based on students' answers. Take one question at a time.

Recap and Discussion

Draw student's attention to the fact that energy is the ability or the capacity to do work. Explain that food (obtained both from plants and animals), petrol and diesel, sunlight and wind, firewood

Only about 8 percent of global energy comes from renewable. The remaining comes from non-renewable sources like oil, coal, and natural gas.

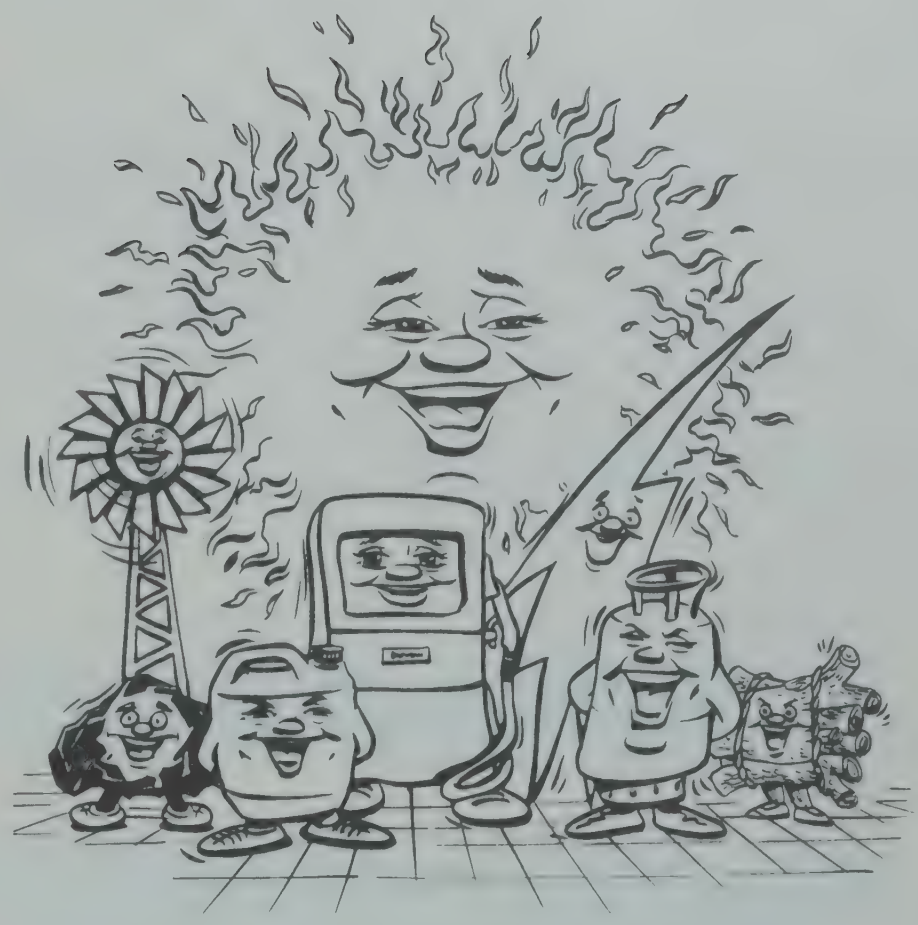
(biomass) are some sources of energy. These serve as inputs for various kinds of work to be done. For example, many of the machines that are made by human requires energy to run. Humans and other animals require food to live and do work. Plants require sunlight to produce food.

Evaluation

Evaluation will be based on the written and oral answers. It is important for the student to have understood that there are many sources of energy. It is not only machines and gadgets that require energy, but all living being require energy.

Home Assignment

Ask students to look at each item listed her and explain why we need it as a source of energy, and how we use its energy



Sun, Fruit or Vegetable, Vegetable Oil, Firewood, Coal, Motor Oil or Petrol, Mortar and Pestle, Bullocks, Firewood, Light Bulb, Lightning, Rubbish Dump, Battery.

Activity 4

Forms of Energy

Objective	:	To study instances where an energy source is converted from one form to another.
Teaching Method	:	Survey
Teaching Aids	:	Paper, pencil
Group Size	:	2 to 3 students
Duration	:	30 minutes each of observation and discussion

Renewable energy resources are indigenous, non-polluting and virtually inexhaustible. *India Energy Portal*

Introduction

Energy exists in many different forms. Examples of these are: light energy, heat energy (sun light), mechanical energy (moving bicycle), gravitational energy (waterfall), electrical energy, sound energy, chemical energy (foodstuffs), nuclear or atomic energy and so on.

Energy can neither be created nor destroyed; it can be transformed from one form to another. We can see conversions in various forms of energy in our day-to-day life.

Because energy can be transformed from one form to another it is of great advantage to us. So, energy from falling water can be tapped to generate electricity and put to use in our homes.

How to Do?

Take the class on a walk outside the school campus. Students should work in groups of 2 to 3. During the walk of about 15-20 minutes, they should be asked to list down all the energy conversions they can see or hear. On their return to the class, ask students to prepare a table in the following manner:

Object	Energy source (what it runs on)	Converted to (form of energy)
Car	Petrol	Motion, sound, heat from exhaust pipe
Lights	Electricity	Light, heat
Chulha	Coal/firewood	Heat and light
Horse	Grass/hay	Motion

Depending on the inputs from different groups, ask the students to prepare a master list of their findings.

Recap and Discussion

Assist students to identify and distinguish between a 'source' of energy and 'form' of energy.

Evaluation

Ask students to make a flow chart which shows the change in the forms of energy from different sources. For example, the energy from the sun is trapped by plants through photosynthesis and is passed through the food chain from one organism to another.

Home Assignment

List all the energy forms and sources you have used during the day.

Compact Flourescent Lamp (CFL) bulbs use a fraction of the electricity and last many times longer than a conventional incandescent bulb.

UNIT PLAN: Class VII

Subject: Science	Topic: Heat
Duration 6 Class periods	**Concepts** • Heat and its characteristics • Energy transfer • Energy conservation by insulators

Instructional Objectives

Students will be able to :

- Determine the temperature of objects.
- Demonstrate the heating effect of sunlight.
- Understand and explain the phenomenon of land and sea breezes.
- Demonstrate that with every energy transfer a loss occurs.
- Demonstrate the conservation of heat by insulators.

Previous Knowledge	Teaching Points
• Heat is a form of energy • Some things heat up quickly and some do not • Sunlight has heat and light • Hot air is lighter than cold air • Some kinds of material helps to keeps things hot.	• How can heat be measured? • What is the role of sunlight in heating up land and water. • Why do some things heat up and cool down faster than others? • What are the advantages and disadvantages of heat flow? • How can heat be conserved?

Teaching and Learning Activities

Activity 1

Light for Heat

Objective	:	To demonstrate the heating effect of sunlight.
Teaching Method	:	Experiment and discussion
Teaching Aids	:	Two identical containers, tin cans or small mugs with large mouths, water insoluble black paint or tar, and a thermometer
Group Size	:	Entire class
Duration	:	30 minutes each, on 2 days

Introduction

Energy from the sun is the main source of energy on this planet. Even before the discovery of the different forms like fossil fuels, hydro, and wind, the heat and light from the sun was used by civilizations. One everyday use of sunlight is to dry our clothes. Agricultural produce is dried in the sunlight. Many perishable foods are dried in the sun to preserve them for long time use.

How to Do?

Take the two containers. Fill both the containers with equal amounts of water. Keep both the containers in the same place for some time. Measure the temperature of water in both containers with a 0°C to 100°C thermometer. Then put one container in sunlight, and keep the other in the shade. Then measure and record the temperature of water in both containers after one hour.

If thermometers are not available, ask students to dip a finger in the water and feel the difference in temperature of the water in both the containers, one after the other.

For the next experiment, paint the inside of one container black with the help of a water insoluble paint or tar. Leave the other container as it is. Fill both the containers with the same amount of water and keep them both in the sun. Measure the temperature of water in both the containers after one hour. Which has warmer water? Why?

I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait till oil and coal run out before we tackle that.

Thomas Edison

Recap and Discussion

Discussion on why the water was warmer in one of the two containers, in the two experiments.

Evaluation

List the different uses of sun's energy (for photosynthesis, maintaining body temperature, cooking, drying, heating water and generating electricity, etc.)

Home Assignment

Ask the students to find out at least three food-related items that have been dried in the sun and preserved (e.g. papad, dry chillies, etc.).

Activity 2

Making a Whirlwind

Objective	:	To demonstrate how a whirlwind is created by unequal heating of ground by sunlight.
Teaching Method	:	Experiment
Teaching Aids	:	Two rectangular sheets of any easily available material - one white which should be about 1 m square and the other black, which should be about 0.30 m square; incense sticks, matchbox with matchsticks
Group Size	:	Entire class
Duration	:	30 minutes

Introduction

Sunlight carries energy, which warms up the earth and is the driving force behind all our weather and climate. By absorbing the heat radiated back from the earth, the air heats up. As hot air expands, it weighs less and floats upwards. Rising air expands, and expansion of a gas cools it down, which is why mountain tops are cooler. This phenomenon is the basic process responsible for weather.

One hour of sunlight can meet the world's energy demands for a year. *National Geographic*

Sunlight also evaporates water–from the oceans, from lakes and rivers and from green plants. Energy is invested in turning liquid water into vapour, and therefore humid air has more energy stored in it than dry air.

How to Do?

Ask the students to place the smaller black sheet at the centre of the white one. These should then be placed in full sunlight on a hot day.

After a few minutes, it will be noticed that the air over the black surface is shimmering. Ask students to think why this may be happening. The teacher should suggest that the air is rising because it has been heated.

After this, the incense sticks should then be lighted and placed on all sides of the sheet.

Ask students to observe the movement of the smoke. The drawing in of the smoke towards the black surface should be noted, and the reasons explained.

Students should also be asked to notice that the smoke spirals upwards over the black area from where the air is rising and that the column of smoke becomes wider as it goes up.

***Note:** Care should be taken that there is no draft of air.*

Recap and Discussion

The experiment explains how hot air raises upward and draws in cold air from the adjacent areas. This is the phenomenon that explains how land and sea breezes are created. Explain how a land breeze is created when the land is cooler than the water. The warm air over the water slowly begins to rise. As the air begins to rise the air over the surface of the ocean, it gets air from the land, thus creating a land breeze.

A sea breeze is created when the surface of the land is heated sufficiently to start air rising. As air rises, it is replaced by air from the sea. This is what we call a sea breeze.

Evaluation

Ask students to relate the weather observed on high mountains and coasts to the experiment they did in the classroom.

Home Assignment

Observe and write down how the column/plume of smoke from a chimney behaves in different weathers.

The wind resource assessment in India estimates the total wind potential to be around 45 000 MW (mega watt). This potential is distributed mainly in the states of Tamil Nadu, Andhra Pradesh, Karnataka, Gujarat, Maharashtra, and Rajasthan. India Energy Portal

Activity 3

Energy Relay

Objective	:	To demonstrate that with every energy transfer, a loss occurs.
Teaching Method	:	Games
Teaching Aids	:	4 cups, spoons (as many as there are students), water
Group Size	:	Two groups of 12 or more
Duration	:	30 minutes

Introduction

Energy changes from one form to another. This process is called transformation. This process can be seen all around us all the time. When we eat food, the body utilizes the chemical energy the food and transforms it into mechanical energy. When we do work, a new form of chemical energy is created when new tissues are made in our body and heat energy to keep us warm.

The transformation of energy is of great advantage to us humans. This allows us to tap the energy in food, fuelwood, petrol and diesel, sunlight and various other sources of energy.

During any kind of energy transformation, some energy is lost to the environment, usually as heat. For example when a bulb is lighted, the light, but some energy is also lost as heat.

How to Do?

Divide the students should be divided into two equal groups. Each group should form a row, standing one behind the other. The rows should be parallel to each other. Each student should stand two paces away from the next student.

Give a cup full of water and a teaspoon to the first student in each row and a similar empty cup to the last student in each row. All the other students should be given a spoon each. The first student with her cup of water stands facing her row. The second student moves to the cup bearer who takes a teaspoonful of water and transfers it to the spoon of the second student.

The second student then takes the spoonful of water and transfers the water to the spoon of the third student. Then the second student goes back to the first student for another spoon of water. In the meanwhile, the third student carries the teaspoonful of water to the fourth student and transfers it to his spoon. The fourth student takes it in his spoon and transfers it into the spoon of the fifth student and so on, till the water reaches the last student. The last student receives the water in his empty cup.

When the leader's cup is empty, let the students see how much water there is in the tail-ender's cup.

The students can play the same game again, taking care to minimize the loss of water (energy) in transfer.

Kilowatt-Hour - The amount of power (kilowatts) used in one hour (kWh).

Recap and Discussion

You could generate a discussion on what happens to the missing spoons of water. Tell the students that each spoonful of water represents a quantity of energy and that loss of energy takes place at every transfer.

Ask students what happens if there were fewer spoons in between? Help students deduce that lesser the steps in a energy transformation process, lesser will be the loss.

Evaluation

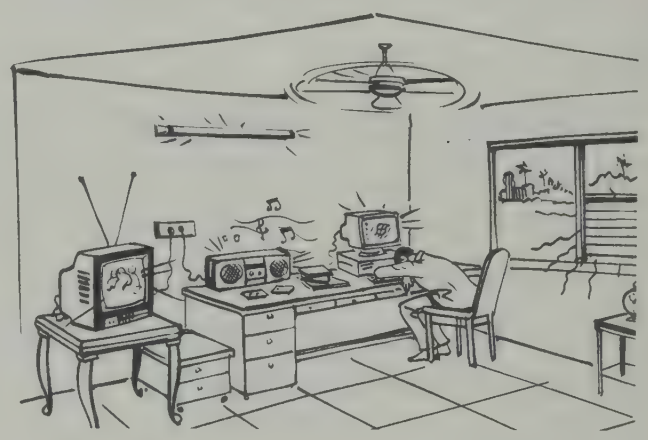
Ask students to identify steps in the electricity generation in a therma/hydro power plant.

Coal→ Heat→ heat the water→ generate steam→ run turbines→ generate electricity→ supply it to homes far away

Home Assignment

Ask students to observe and think how and where energy is lost in the use of different appliances and gadgets.

- Computer
- Light bulb
- Table fan
- Gas stove
- Mobile phone
- Car/bus
- Battery light



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Activity 4

Keep it Hot

Objective	:	To show how heat energy can be stored or conserved by using insulators.
Teaching Method	:	Demonstration
Teaching Aids	:	Two metal tumblers, lids for the tumblers, a thick cardboard box, rags, straw, paper, two laboratory thermometers, water, stove, vessels for boiling water.
Group Size	:	Individual or 2 to 3 students
Duration	:	60 minutes

Establish a habit of turning room lights off when a room is going to be empty even for just a few minutes.

Introduction

When energy is produced through electricity, the sun, burning firewood, or gas, it is heat that is actually getting produced. Heat loves to travel or flow from warmer material to a colder material. Some materials allow heat to travel through easily and some do not. Heat can be stored with the help of insulation. Insulation prevents heat from escaping an object. Thus, insulators help conserve heat energy.

How to Do?

Boil water and fill two metal tumblers with it. Let the students record the temperature in each tumbler with the help of a thermometer. Cover the tumblers with lids. Put one tumbler inside a cardboard box lined with old rags. The other one should be left as it is.

After 15 minutes, let the students record the temperature of water in both the tumblers. Is there any difference in the temperature readings between the two tumblers?

Repeat the experiment using boxes lined with different materials like straw, thermocol, etc. Let them also carry out the experiment with a box with no lining. Note the differences in temperature readings. Which of the materials are good insulators?

Recap and Discussion

Engage students in a discussion on how important insulators are in conserving heat energy.

Evaluation

If you boil a tea pot on the stove, the pot becomes too hot to touch whereas the tea pot handle does not get hot. Why is this so?

Why does the tea remain hot in a thermos flask for a long time?

Home Assignment

Ask students to relate the learnings from these experiments to explain why we wear woollen or heavy cotton clothes, and use blankets or quilts in winter. Discuss how animals keep warm in cold conditions.

Energy conservation is often the cheapest, and perhaps the largest source of energy available to us.

UNIT PLAN: Class VIII

Subject: Science	Unit: Energy
Duration 6 Class periods	**Concepts** • Natural resources like wind, water, fossil fuels, sunlight are sources of energy. • Some energy sources are limited and exhaustible. • Conventional and non-conventional energy sources. • Burning fuels lead to the release of harmful substances.

Instructional Objectives

Students will be able to :

- To demonstrate energy saved due to cooking in covered vessels versus uncovered vessels.
- Rate various energy sources (exhaustible and inexhaustible) on the basis of their environmental impacts.
- Read, understand and analyse electricity bills.
- Understand the importance of using energy efficient appliances.
- Understand how good habits help conserve exhaustible resources.

Previous Knowledge	Teaching Points
• Energy is obtained from many sources. • Energy is needed for all our daily activities. • Familiarity with simple cooking practices. • We pay for electricity use. • Our habits have an environmental impact.	• What are the different kinds of energy that we use? • What determines our choice of the kind of energy that we use? • What are the different stages through which energy becomes available for our use? • How can we use the wattage details to calculate electricity consumption? • How can we as individuals conserve energy?

Activity 1

Energy Detectives

Objective	:	To observe and classify various energy sources, predict and infer impacts of tapping energy from these various energy sources.
Teaching Method	:	Observation and discussion
Teaching Aids	:	Writing Material
Group Size	:	Entire class
Duration	:	60 minutes

Introduction

Energy requirements are increasing because of rapid industrialization, mechanization, economic growth, and changing life styles. A significant part of the energy comes from sources like petrol, electricity, cooking gas, kerosene etc. There is also a significant contribution of non-commercial energy sources like dung, agriculture waste, firewood etc.

Energy use is determined by various factors like availability, accessibility, suitability, cost, etc.

How to Do?

Tell the students to identify different energy sources used in their homes and in the community. Draw their attention to the fact that depending on access and affordability, different energy sources are used. For example, unless people have access to LPG supplies (either bottled in cylinders or through a network of pipelines), it cannot be used. Similarly, a farmer might find it economical to use animals-of-burden to work on his farm and transport his goods than depend on petrol or diesel-driven tractor.

Another aspect of energy use is its suitability. For instance, a housewife would depend on sunlight to dry papad and use charcoal to roast corncobs. Similarly, an ore smelting factory would need only coke as an energy source for smelting ore.

List on the blackboard the energy sources that are locally used by people of the community. For example: Saw dust, Dung cakes, Fuelwood, Charcoal, LPG, Solar Energy, Electricity (electricity is a form of energy and not a source as it is commonly understood to be)

Energy is the ability to do work. It comes in different forms thermal (heat), radiant (light), mechanical, electrical, chemical, and nuclear energy. Energy is in everything.

Recap and Discussion

Divide the class into 6 groups. Assign one energy source to each group. Invite the assigned groups to make their presentations. Let each group choose one student to make the presentation. Encourage them to make charts to do the presentation. Let the other groups give their observations.

Evaluation

Ask student to think and discuss what would be the impact on the environment of the following:

Large scale tree felling for firewood.

Electricity generated from thermal power plants using coal as the fuel.

Cars using petrol as the fuel.

Let each group develop a report which looks at the various aspects of the origin, process and use of the energy source. Some points to consider are given here.

- Is it a renewable/non-renewable/perpetual source of energy? (Electricity can be classified as renewable if not generated from fossil fuels or nuclear power) Can the energy source be used without exhausting it? Even if it were a renewable source, is the use outstripping its ability to renew itself? For example use of fuelwood. What happens when a stretch of forest is cleared over time before it can regenerate and we can harvest fuelwood. Do the impacts outweigh its use?
- Find out the history of the use of this energy source. How long has this energy source been in use? One way to find is to talk to people of older generations.
- How is this energy available for use? Do you have to buy it?
- Where is this energy source maximum used? Industries/transportation/ domestic use, etc.
- Can the energy source be used directly or does it have to pass through intermediary processes to be usable by the consumer? For example, dung cakes have to made and dried before they can be used.
- What is the potential of availability of this energy source in our country? For example, in the case of solar energy, in most parts of the country, out of the 365 days, 300 days are sunny. To put in another way, India receives 5000 trillion kWh of solar radiation per year. With such a potential what are the ways in which households and industries can tap this energy?
- What are the prospects and constraints of the energy source with regard to its affordability and accessibility? Is it affordable by the poor? Does it affect the health of person using it?

Biogas is a mixture of methane and carbon dioxide. Methane is produced when vegetation is burned, digested or rotted with no oxygen present.

- Does tapping this energy source have any direct or indirect impact on
  1. Wildlife
  2. Air/water/soil
  3. Humans

Home Assignment

Make a list of all the energy sources (electricity, cooking fuel, petrol/diesel) used at home. Find out how much the family spends every month on each of these.

Activity 2

Steps to a Hot Bath

Objective	:	To help students understand the various steps in energy generation and also analyze and rate various energy sources on the basis of their environmental impacts.
Teaching Method	:	Analysis
Teaching Aids	:	Writing material
Group size	:	Groups of 5
Duration	:	30 minutes

Introduction

There are various steps involved in converting different sources of energy into a form of usable energy. Some resources like firewood may not need any conversion for direct use. But many other resources like coal, natural gas and nuclear material have to be mined in the first place and transported for refining/enriching to allow further use. This and energy generation require large infrastructure. This will help them realize that all energy resources must be processed and converted by machines and other kinds of equipment into usable energy for end use. This would involve many steps/stages.

Fifty percent of the energy consumed in India is used for cooking. Quite a lot of fuel is also used in reheating cooked food.

How to Do?

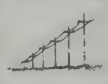
Let students list all the sources of energy required to heat a bucketful of water for a hot bath. (Please note that electricity is a form of energy and not an energy source).

Ask the students to think of the various steps involved in converting different sources of energy into a source of usable energy.

Now, draw the Energy Source–Steps–Consequences matrix on the black board. The columns represent energy sources, while the rows discuss associated factors. Assign one energy source to each group.

Let them discuss within the group which of the steps and consequences identified and listed in the matrix are applicable to the energy resource given to them. After 10 minutes, one from the group could come to the board and put a cross mark against each applicable stage and consequence. Tally the number of crosses. The number of crosses for an energy source is indicative of its degree of deviation from an ideal source.

Steps to a Hot Bath

	Nuclear	Coal	Hydro	Solar
Mining ↓				
Transportation ↓				
Enriching ↓				
Transportation ↓				
Generating ↓				
Transmission ↓				
Hot Bath ↓				
Waste & Pollution ↓				

Recap and Discussion

Help students list the environmental and other consequences of various stages of energy production which are seldom taken note of. Some of these are:

- Energy itself is consumed in each stage of energy production (e.g. mining coal requires equipments that run on diesel, petrol and electricity). Every step adds a monetary cost.
- Also, these activities pollute natural resources like air, water, soil and the constituents of the natural environment. Waste is generated in large quantities in this process. The pollutants and wastes affect human health too.
- Energy generating set-ups may be sources of potential hazard. For instance, a nuclear plant is a threat to the area around; a dam impounding huge amounts of water could breach and inundate low lying areas which would dispose human habitations as well as destroy forests.

Evaluation

Discuss the major sources of electricity generation in India—thermal (based on coal and natural gas), hydel, wind and nuclear power. Ask students to evaluate these on environmental factors.

Home Assignment

Ask students to find out about alternate energy sources (wind, solar, biogas etc.) that are considered safe for the environment. Ask them to make charts and put up in the school.

There is no "energy for free". All of us have to pay for energy wasted in terms of environmental costs-the natural resources used and the pollution created.

Activity 3

Hot Facts

Objective	:	To demonstrate the difference in energy consumption when cooking in covered and uncovered vessels.
Teaching Method	:	Experiment
Teaching Aids	:	Cooking vessel with lid, water, stove, clock
Group Size	:	Entire class
Duration	:	30 - 40 minutes

Introduction

Energy can be used efficiently and carefully. Conservation of energy is an important strategy because every unit saved is as good as every unit generated. Besides it is cheaper to save energy than produce. It saves money and has environmental benefits as well.

How to Do?

Ask the students to do the following:

Pour two cups of water into a vessel.

Place it on a lighted stove and record the time required for the water to boil. Empty the vessel and let it cool.

Pour two cups of water into the vessel again and cover it with a tight-fitting lid. Place the vessel on the stove and record the time that it takes for the water to boil.

You will know that it is boiling when you can hear the water against the sides. In which case does the water take more time to boil - when the vessel is without the lid or with the lid on?

Recap and Discussion

Discuss with the students how they will save cooking energy at home, what they will do to keep bath water warm, etc.

Evaluation

Ask students to list the economic benefits that both a household and the country can get out of using energy wisely.

According to some estimates, over 500 million tonnes of agricultural and agro-industrial residue alone is generated every year in India. This quantity, in terms of heat content, is equivalent to about 175 million tonnes of oil.

Home Assignment

Ask students to observe the cooking practices in their home, talk to their parents and find out two ways in which the cooking practice helps to save cooking fuel (soaking pulses before cooking, using pressure cooker etc.) They should also try to suggest two additional changes in cooking practice that can help save energy.

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Activity 4

Energy Calculator

Objective	:	To gather wattage data and calculate electricity consumption of various electrical appliances.
Teaching Method	:	Survey and calculation
Teaching Aids	:	Writing material, electricity bill with tariff details, user guides of different appliances
Group Size	:	Individual or in groups
Duration	:	30 minutes

Introduction

With our increasing use of appliances such as televisions, refrigerators, washing machines, ceiling fans, electric irons, water pumps, music systems, computers and more, electricity consumption is increasing rapidly. It is important for every consumer to understand how much electricity is consumed by each appliance, how the energy consumption can be calculated, and how much we have to pay for it.

How to Do?

Gathering wattage details of electric appliances

Tell students to collect wattage details of various appliances. Wattage details are given in the user guides of all appliances, and also often on the appliance.

Energy Star is an international standard for energy efficient consumer products.

Unit cost of electricity

Ask students to get an electricity bill. In the class, discuss the terms 'meter reading', 'units', 'tariff', etc. that appear on an electricity bill. Let them note down the unit cost of electricity.

Calculating Energy bill

E.g. A 60 W electric fan running for 24 hours consumes 60 x 24 hours= 1440 Wh or 1.44kWh
(1000Wh=1 kWh)

Let's say, 1 kWh costs Rs. 2.30, then the cost of running the fan for 24 hours would be
1.44 kWh x Rs 2.30 = Rs 3.312

Recap and Discussion

Discuss how wattage ratings help to find out the energy consumption of an electric appliance. How will knowing about wattage ratings help us to make the necessary choice of an appliance?

Evaluation

Students can compare the efficiency of an incandescent bulb, a tube light and a CFL.

Home Assignment

Tell students to collect wattage details of various appliances that they have at home and do the necessary computations of energy consumption.

Activity 5

Energy Report Card

Objective	:	To enable students to understand good and bad habits in relation to energy conservation.
Teaching Method	:	Audit
Teaching Aids	:	Large paper, pencil
Group Size	:	Individual
Duration	:	One week for audit and 30 minutes for discussion

Keeping computer, monitor and other home appliances on stand-by mode adds to the electricity bill and generates greenhouse gases. Switch these off when not in use.

Introduction

Energy conservation is not optional, but essential. At an individual level energy can be saved in some simple ways—by changing energy wasting habits and lifestyles. Such changes in habits do not cost any money but the savings are manifold.

How to Do?

Together with the students, compile a list of good habits with regard to energy conservation. Ask each student to make a list of these good habits and tell them to monitor their energy habits with the help of this. A sample is given below:

Energy Habit	Always Do	Sometimes Do	Never Do
• Turn off the light when I leave the room • Turn off the fan when I leave the room • Walk to School • Close refrigerator door quickly • Cover vessel with a lid while cooking • Use mains rather than batteries			

Recap and Discussion

Discuss how in Electricity bulbs, the per unit rate is linked to consumption slabs. The more you conserve, the more you pay per unit.

Discuss good habits for saving energy in the neighbourhood.

Evaluation

Observe whether students follow good energy habits in the class and school (ensuring that fans and lights are switched off when they leave the room)

Home Assignment

Ask students that they should get every member of the family to fill in the table above and give each member a "Energy Wise" star rating on a scale of 1-5 with 5 stars being the best energy saver.

Kilowatt - 1000 watts. A unit of measure for an amount of power. Light bulbs usually specify how many watts they use. The standard tubelight bulb is 34 watts.

UNIT PLAN: Class VI

Subject: Science	Unit: Waste
Duration 5 Class periods	Concepts • Generation and disposal of waste • Types of waste • Degradation of waste • Waste reduction

Instructional Objectives

Students will be able to :

- Understand that waste contains degradable and non-degradable things.
- Find out that different kinds of waste take different time periods to degrade.
- Find out how waste is disposed.
- Find out how much waste and the kinds of waste that is generated in households.
- Find out how much plastic is used through a simple survey.

Previous Knowledge	Teaching Points
• Unwanted material is called as waste • Waste comes from homes and schools • Waste is usually collected from homes and/or dumped at a place • Some wastes rot and some do not • Disposed plastic is a waste.	• Where is waste dumped? • What is degradation? • What is biodegradation? • What are the substances that degrade and that do not? • Do all the degradable substances take the same time to degrade? • How much plastic is used by us?

Activity 1

Biodegradable or Non-biodegradable?

Objective: To classify objects as biodegradable and non-biodegradable.

Teaching Method	:	Game
Teaching Aids	:	Different kinds of biodegradable and non-biodegradable objects (about 10 objects each), large tray, cloth to cover
Group Size	:	Up to 30
Duration	:	30 minutes

Introduction

It is common knowledge that many of the items in the kitchen and garden waste rot over a period of time. Those wastes that rot are undergoing the process of degradation. This process is aided by microorganisms and it is a useful process that removes waste. But there are many other items in the garbage that do not rot. They stay intact. It is important understand how garbage includes both kinds of items.

How to Do?

Collect ten biodegradable and ten non-biodegradable objects (see sample list on next page).

Jumble the objects and arrange them on a tray. Cover the tray with a cloth. Tell the students that you would show them a collection of different items for 30 seconds. After showing the items, cover the tray again with the cloth. Now, ask them to list down on a paper, the items which they remember seeing on the tray. The students should then group the items into two categories—biodegradable and non-biodegradable.

After they finish, ask each student how he/she has grouped the items. Write the items under the heads 'Biodegradable' and 'Non-biodegradable' on the board for every one to see and discuss.

There is no waste in functioning biological communities; the wastes or dead bodies of one form of life are food or nutrients for other forms of life.

Sample List

Biodegradable	Non-biodegradable
Banana skin	Styrofoam cup
Handkerchief	Plastic bag
Paper	Empty fruit juice pack
Dry leaves	Toothpaste tube
Dead insect	Broken plastic toy
Leather belt	Rexine bag
Flowers	Glass bangle
Wooden ladle	Metal spoon
Potato	Plastic pencil box
Rag doll	Plastic doll

Recap and Discussion

What does 'biodegradable' and 'non-biodegradable' mean?

Explain that degradation means decay and 'bio' means such decay which is carried out by microorganisms. Bacteria, fungi, insects, worms and other organisms eat this material and convert them into new forms. So, biodegradable waste can be composted to obtain natural manure.

Not all materials however change form. These are usually made up of material that are not natural but synthetic or human made. It is these materials that add to the problem of waste.

Evaluation

How can we manage biodegradable and non-biodegradable wastes? Which wastes are manageable?

Home Assignment

Ask students to list down, from their daily activities ten items that they regularly use which are non-biodegradable and ten items which are biodegradable.

Nearly 90 per cent of plastic water bottles are not recycled. They may take hundreds of year to decompose.

Activity 2

When do they Degrade?

Objective	:	To understand what degradation is and find out how much time different materials take to degrade.
Teaching Method	:	Experiment
Teaching Aids	:	Writing material, items mentioned in the table 'When will they degrade'?
Group Size	:	Groups of 5-6 students
Duration	:	30 minutes for the activity, 20 minutes once every week, after initiating the activity.

Introduction

What happens to all the leaves and other parts shed by trees? Do they get piled up around the trees? Why do we never come across huge piles of dead fallen leaves around trees? What could be happening?

Do all things that we throw or discard degrade and get assimilated into the soil? And if at all they degrade how long do they take to degrade?

How to Do?

Let students carry out this experiment.

Ask them to bring, or collect, a banana peel, a paper bag, a cotton bag, a piece of wood, an aluminium can, a plastic bag, a styrofoam container, a piece of glass.

Identify a small corner in the garden and ask children to dig out the soil by about six inches and spreading out the above listed things separately in the pit. They could mark the pit by planting a flag or putting a stone over the area.

Exactly after a week, let them carefully remove the soil to see in what state various products are. Ask them to note down their observations. How do the different objects look?

Students should carry out observations once every week. It would be good if this was continued through a period of 3-4 months.

Compare the observation with information given in the table 'When will they degrade?'

Recap and Discussion

Why is it important to understand how long it takes certain materials to degrade, and how some materials take very long to degrade naturally. Categorization of waste based on their degradability is the first step in waste management. This helps in segregating and disposing it.

Discuss how in nature's cycle, whatever comes from nature goes back to nature. Everything becomes a resource for the others. Plant matter decays and mixes with the soil. It is eaten by insects and microorganisms. Animal matter also decomposes. For example, an earthworm feeds on decomposed plant matter. This passes through the body during which the earthworm uses minerals and nutrients in it for itself. The rest come out as droppings. These are called castings and they make soil fertile and crumbly. In this process the nutrients are returned to the soil. Earthworms are used in the process of composting. This is called vermicomposting.

Evaluation

At the end of the experiment period, students should make a chart presenting their observations and recordings.

Home Assignment

Ask students to note what happens to the kitchen waste (fruit and vegetable peels, left over food, etc.) in their house. Is there any waste from the garden (dry leaves, grass cuttings, etc.)? Is it possible to make a compost pit near their house?

When will they degrade?

Materials	Time taken to degrade
Banana peel	Three to four weeks
Paper bag	One month
Cotton bag	Five months
Bamboo pole	1-3 years
Wood	10-15 years
Leather shoe	40-50 years
Tin can	50-100 years
Aluminium can	200-500 years
Plastic bag	One million years
Styrofoam container	Eternity
Glass	Unknown

About 30-55 per cent of the waste in India is biodegradable. It can be turned into compost.

Activity 3

Home Garbage Audit

Objective	:	To understand that change in lifestyles and habits has contributed to waste problems. To become aware that growing consumption has led to increase in garbage.
Teaching Method	:	Survey
Teaching Aids	:	Copies of the Home Garbage Survey Sheet
Group size	:	Individual
Duration	:	A week for the survey, 30 minutes for the activity

Introduction

Where does garbage come from? Much of it comes from households. Can students guess approximately how much waste is generated in their home per day? One way to find out is by carrying out a survey. It helps to understand the quantity and kinds of wastes generated at the household level.

How to Do?

Ask students to note the garbage thrown out daily by their family and fill the Home Garbage Survey Chart.

Before filling the chart, set a unit of measurement for each item, that is, glass or containers could be counted by number of items. Paper may be counted by number of pieces or sheets. Kitchen waste may have to be weighed or measured in a standard measure: e.g. cup or small pan.

Let them make their observations for a week. Add up and calculate the approximate weight of the waste for the entire week. Find out the average waste generated per day in their home.

Home Garbage Survey Chart

Day	Types of Garbage					
	Paper	Glass	Aluminium/ tin	Plastic	Kitchen waste	Others (batteries, etc.)
Mon Tue Wed Thu Fri Sat Sun						

Note: Care should be taken while sorting the garbage. Wear gloves while sorting and wash hands well with soap after the exercise.

Recap and Discussion

Ask students to tell what are the advantages of carrying out a survey like this? How can waste management to be taken up once you know the quantity of waste, and the kinds of wastes that are generated?

Evaluation

Let students present their survey findings. What makes up the maximum part of the waste? Are the quantities almost similar? If there are great variations, discuss why this may be (more family members, more use of packaged goods, etc.)?

Extend the calculations to obtain the approximate quantity of waste generated by households in a block of flats, township, village, town, city, etc.

Home Assignment

Based on the survey results, students could suggest three ways in which they can reduce the generation of non-biodegradable waste at home?

Reusing is better than recycling. Eg. the electricity used in recycling one soft drink can will run a TV for 3 hours.

Activity 4

Plastic Bags

Objective	:	To generate awareness about the use of plastic, and to plan and run a campaign to reduce the use.
Teaching Method	:	Survey, Campaign
Teaching Aids	:	Copies of the Plastic Bags in my Life survey sheet
Group size	:	Individual
Duration	:	A week for the survey, 30 minutes for the activity

Introduction

Plastics have become so much a part of our daily life that we do not even realize how much we use them and how to reduce their use. Nor do we realize the harmful impact of this on the environment.

Use this activity to motivate the students to become change agents and convince their friends and families about the benefits of banning plastic bags which are less than 40 microns in thickness and considering environment-friendly alternatives.

How to Do?

Ask each student in the class to fill in the questionnaire 'Plastic Bags in My life' given on next page. You can either photocopy it or display it for students to copy it.

After all the students have filled in the questionnaire, calculate how many plastic bags are used by your class.

For example:

Plastic bags used by a class of 30 students/day: 90

Plastic bags used by the class in one month: 2700 (90 x 30)

Based on this average, calculate how many plastic bags would be used by all the classes in the school in one month.

Recap and Discussion

Based on the answers to question 6, let students draw up a list of actions which can help to reduce this plastic use. Do the students think that it is alright to use plastic bags if you can pay for these?

Plastics end up as ocean debris cause habitat destruction and entangle and kill tens of thousands of marine animals each year.

Discuss how they should plan a campaign to share this information with the rest to reduce the use of plastic bags in the school. Students should develop and plan the strategy and the materials they need for this (develop posters, skits, talks in the assembly etc.).

Evaluation

The students should be able to achieve a 'plastic bag free' classroom over a period of time.

Home Assignment

Students should identify one routine use of plastic bags at home that can be reduced or stopped. For example buying vegetables in plastic bags, taking lunch box in plastic bag.

Plastic Bags in My Life

Name of Student: Class:

1. For what purposes do you use plastic bags?
2. Do you bring plastic bags to school?
3. List down things that you bring to school in plastic bags.
4. Approximately how many plastic bags do you throw away in one day?
5. Did you reuse the plastic bag which you got during your last shopping trip? How?
6. Can you think of three ways in which you can reduce your use of plastic bags?

The rules of the Government of India prohibit vendors from using carry bags or containers made of recycled plastics. The minimum thickness of plastic carry bags shall not be less than 40 microns.

UNIT PLAN: Class VII

Subject: Science	Unit: Waste
Duration 4 Class periods	**Concepts** • Waste water disposal • Harmful effects of improper disposal • Contamination of ground water • Problems related to sewage disposal

Instructional Objectives

Students will be able to :

- Understand that stagnant pools are the breeding ground for mosquitoes.
- Identify stagnant pools of water.
- Understand the reason for algal blooms in water bodies.
- Understand that sewage has to be treated before disposal.
- Take initiative to write to civic authorities on the quality of service provided.

Previous Knowledge	Teaching Points
• Dirty water pools contain many insects floating on them • We fall sick if mosquitoes bite us • Detergents are used to clean clothes and other things at home • Some lakes and ponds have a lot of plants and algae in them	• What happens if dirty water collects at a place? • What are the reasons for water to collect at a place? • What does sewage contain? • What happens when untreated sewage is let in to water bodies? • Who is responsible for providing basic civic amenities?

Activity 1

Mosquito Buzz!

Objective	:	To comprehend that accumulated water could spread disease by allowing mosquitoes to breed.
Teaching Method	:	Survey and Discussion
Teaching Aids	:	Observation notebook, pen
Group Size	:	Groups of 5
Duration	:	30 minutes

Introduction

Stagnant pools of water and choked drains are the breeding ground for mosquitoes.

Water that stagnates in air coolers, clogged gutters, rainwater pools, bird baths, sewage puddles, old tyres, cans, bottles, coconut shells, and construction debris is an ideal location for mosquitoes to breed.

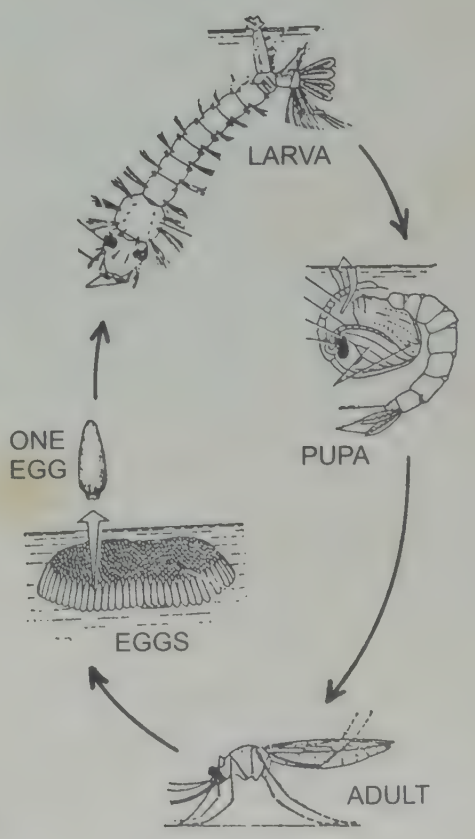
Sewage from homes, schools and other establishments, or rainwater puddles that form especially wherever the ground is uneven are also places that attract mosquitoes to breed. Mosquito bites can cause disease.

How to Do?

Divide students into groups. Ask the groups to go around the school premises and the area just outside the school. They must observe and find out if there are stagnant pools of water anywhere. Ask them also to look for anything that might hold water, or for places that have a tendency to accumulate water (old tyres, containers, etc).

Students should also closely observe the water to see if there is any insect life to be seen. They must specially look out for mosquito larvae.

After the survey, let them return to the class. Each group should present their findings. These should be put up on a chart. They should put down the location of the water pool and possible causes



According to the World Health Organization more than 2.5 million people die due to mosquito-borne diseases. Many of these are young children.

for this. For example, an unused water tank, discarded pots, depression into ground, etc.

Recap and Discussion

Draw out the linkage between stagnant water, sewage, garbage and health. Waste affects community health by allowing disease causing agents like mosquitoes, flies, rats, etc., to breed and thrive. Discuss possible measures to minimize the spread of such diseases.

Evaluation

Let them brainstorm on ways to eliminate the identified mosquito breeding sites. They can undertake suitable measures at the places that they have identified during their survey.

Let students develop a plan of action to take steps to prevent water stagnation. In case all the actions and remedies suggested cannot be carried out by students themselves they can alert school or local authorities by bringing to their notice the exact location of these puddles and accumulated garbage or debris.

Home Assignment

Let students undertake a similar survey around their home and note down sites of water and garbage accumulation. Let each one think of some way to prevent this.

Some of the measures to tackle mosquito breeding sites are :

- Level the ground to avoid pockets of standing water or make channels to drain out collected water.
- Periodically drain out water from bird baths and air coolers, etc.
- Avoid dumping garbage into drains to allow for free flow of sewage.
- Periodically declog choked gutters.
- Look for ways of proper disposal of old tyres, pierced coconuts, discarded cans, bottles and other products that accumulate water.

Frogs and toads are voracious insect eaters. They can help to control the mosquito menace.

Activity 2

Algal Bloom

Objective	:	To understand how phosphates in detergents and fertilizers affect algal growth.
Teaching Method	:	Experiment
Teaching Aids	:	Two glass jars, algae, one teaspoonful of detergent powder or any phosphate fertilizer, water.
Group Size	:	Entire class
Duration	:	2 weeks, with 10 minutes for observation in each period. 30 minutes for setting up 30 minutes for discussion.

Introduction

Detergents are surface-active agents which aid in removal of dirt from surfaces such humans, skin, textiles etc. Detergents are used in every household for washing clothes, cleaning utensils and floors, glass and electronic items. Much of these detergents find their way out through the sewage and enter water bodies.

Most detergents contain phosphates which soften the water in order to improve cleansing action. These phosphates mix with the waste water from washing. This water joins the sewage and it flows into a water body. The phosphates contribute to the oversupply of nutrients to water bodies. This leads profuse growth and spread of algae in the water. In this activity students can observe this process.

How to Do?

Ask students to collect some algae from a pond or a ditch. Let them take two jars. They should fill three-fourths of one with tap water and three-fourths of the other with water containing some detergent or any phosphate fertilizer. Now let them add small but equal amounts of algae to both the jars. Let the jars remain in direct sunlight for two weeks.

After two weeks ask the students to compare the algal growth. Which jar has more algal growth?

Discuss why this happens and relate this activity to the effects of polluted water containing phosphates on water bodies like lakes and ponds.

Out of 3119 towns and cities in India, only around 220 have any kind of treatment for waste water.

Evaluation

Ask students to describe the implications of detergent used in the households. How would it affect the organisms living in the water into which phosphate loaded sewage is let out.

Home Assignment

Ask students to calculate the amount of various detergents and cleaners used at home over a period of one month.

Ask them to find out if there are some natural things that can be used as cleaners. Some of the natural cleaners used in earlier days were ash, tamarind, vinegar, etc.

Activity 3

Action Please!

Objective	:	To report to concerned local authorities and the press about issues and concerns of one's neighbourhood.
Teaching Method	:	Analysis and Discussion
Teaching Aids	:	Writing material
Group Size	:	Entire Class/Individual
Duration	:	30-45 minutes

Introduction

Government provides us with the most essential services that we all need—the police, the postal department, hospitals and the public distribution system, fire fighting, and civic services and amenities. The government collects taxes to provide for these services and amenities. As citizens it is our right to enjoy the civic amenities. It is also our responsibility to make sure that such services and amenities are provided, and to help maintain these properly.

How to Do?

Ask the students to think about the different services provided in their neighbourhood. You can guide them in this exercise by asking these questions.

Is the garbage being removed regularly?

Is the water supply regular?

Are the drains being cleaned?

Are the roads in proper shape?

Is there parking provided in the busy areas of the city/ town?

Is the transportation system catering to the needs of the residents?

Are the street lamps working?

Recap and Discussion

Ask students if by and large they are satisfied or not satisfied by the services and amenities. Discuss what are some things they can do to address this issue. For example students should bring this to the notice of the concerned officials (Municipal Corporation/Panchayat/Public Health Department, PWD, etc.) giving specific details of the problem and requesting action. They can do that either by directly writing to them or to the editor of the local newspaper.

Sometimes just a little effort can lead to small victories. Share with the students an example of action demanded by an individual and the response received. These appeared in a weekly column devoted to readers' complaints and suggestions in a Bangalore newspaper. (See next page)

Students could even write a commendation letter if a particular service provided is adequate and satisfactory.

Students can also directly meet the concerned officials for discussing possible measures to improve the situation.

Evaluation

Students can make posters and organize an exhibition for the whole school to become aware about their rights and duties as citizens. They can plan a rally to draw peoples' and concerned department's attention to a particular issue.

Home Assignment

Ask students to find out the names and addresses of the departments that are responsible for the providing the following amenities and services:

1. street lights
2. drinking water
3. waste collection
4. upkeep of drains

In Singapore littering is punishable by fines. Repeat offenders may have to carry out public cleaning activities for up to three hours.

5. upkeep of roads and parks
6. maintenance of bus shelters.

Complaint

The Indian EXPRESS August 9

Clear Garbage

Sir,

This is just to draw your attention towards the negligence of the authorities concerned with clearing garbage.

Just opposite my bedroom is the Corporation dust bin, which is overflowing, but its clearance is regularly irregular. It is cleared once in 15-20 days, as a result of which I have developed a skin allergy.

In case the same condition continues, I am sure our Garden City will definitely become a 'Garbage City'.

Will the Corporation act?

BK ROHINI Rajajinagar, Bangalore

Response

The Indian EXPRESS August 23

Instructions Issued

Sir—With reference to B K Rohini's letter (IE, Aug. 9), the garbage mentioned in the complaint has been cleared and strict instructions have been given to Senior Health Inspector to maintain cleanliness in this area and clear garbage regularly.

PRO, City Corporation, Bangalore

The sustainable solution to address the issue of waste is to begin by reducing waste in the first place.

UNIT PLAN: Class VIII

Subject: Science	Unit: Waste
Duration 5 Class periods	**Concepts** • Plastics and packaging • Synthetic materials • Plastics: harmful effects • Cause of pollution of air and water

Instructional Objectives

Students will be able to :

- Deduce that packaging is a main source of non-biodegradable waste.
- Appreciate that while plastic is a boon for packaging it has many disadvantages.
- Infer that burning waste is converting waste in solid form to gaseous form.
- Recognize that many human activities are the source of particulate pollutants in the air.

Previous Knowledge	Teaching Points
• Goods have to be packed • Usually plastic and paper are used for packaging various goods • People burn waste to deal with solid waste • Air gets polluted by burning waste and by exhaust from vehicles	• Why are most goods packaged? • What is the material used for packaging? • What happens to packaging material after the goods are used? • Is burning solid waste a solution for solid waste management? • What are the common sources that pollute air?

Activity 1

Packaging Problem

Objective	:	To analyze and examine packaging of products and impacts of packaging material on environment.
Teaching Method	:	Survey
Teaching Aids	:	Writing materials
Group Size	:	Entire Class
Duration	:	30 minutes

Introduction

Packaging helps to contain, carry and distribute materials easily. It helps keep things clean and fresh. It protects products from being adulterated. It gives information about the product, instructions for use, ingredients, manufacturing and 'best before use' dates.

Today however packaging is also used to advertise products, to attract people to buy and, to boost sales. Often there is much more packaging than is needed to safely pack and transport a product. Packaging has become a necessary evil.

How to Do?

Ask students to list down all the items that they have bought from the market, kirana or departmental stores for the monthly use in their house (Cereals, flours, oils, soaps, detergents, biscuits, etc).

Ask them if they have noticed that along with all these items, they also get something they do not need; things that they would throw away. Tell them it is packaging that you were referring to. Discuss why goods need to be packaged.

Ask students to visit a departmental store/grocery store. Let them take a close look at the products on the shelves and conduct a survey. They should note down:

What kind of packaging is most common?

What kind of packaging is the most attractive?

What kinds of products have maximum packaging? (Those that may spoil easily, that may break easily, that can be adulterated? etc.)

India generates packaging waste of 32 million metric tons/year. Packaging waste forms 16 per cent of municipal solid waste.

How much of the packaging is necessary?

They should bring their survey findings to the class. These should be shared and a consolidated set of answers should be prepared.

Recap and Discussion

Give reasons why most of the items these days come in packaging? Ask students what happens to all the packaging? (While the polythene bags may be reused once again, the rest of that packaging ends up in our garbage bins, and on our roads, in our garbage dumps and our landfills.)

Discuss how managing waste would become difficult if everything we use everyday comes in many layers of packaging? Do we have the space to dispose them off?

Evaluation

Suggest 5 ways in which packaging waste can be minimised or avoided.

Home Assignment

List items of common use and compare the nature of packaging. Discuss the change in the nature of packaging from reusable or degradable, to throw-away and non-biodegradable.

Thousands of paper and plastic shopping bags end up in landfills every year. They are not easily degradable. Reduce the number of bags thrown out by bringing reusable cloth bags.

Activity 2

Synthetic Materials

Objective	:	To map the advantages and disadvantages of some synthetic materials, and to suggest alternatives.
Teaching Method	:	Discussion and observation
Teaching Aids	:	Observation notebook
Group Size	:	Entire class in 2 groups
Duration	:	60 minutes

Introduction

Some of the most notable achievements in modern chemistry have come from efforts to create whole new classes of materials. They are called synthetic materials. These materials are not found in nature. Scientists have developed synthetic materials to replace and complement the existing range of natural material. These synthetic materials have advantages and disadvantages. Three major areas where were such materials find use are, eateries and food establishments, households, and packaging. The raw material for these mainly comes from petrochemicals, other organic and inorganic chemicals and minerals.

How to Do?

Divide the class into two groups and ask them to come up with;

Group 1: A list of synthetic materials that are commonly used these days (Paints, plastics, detergents, various polymers of fabrics, medicines, pesticides, fertilizers, etc.)

Group 2: The commonplace use of synthetic materials (paints, insulating material, tyres, adhesives, packaging materials—like bottles, containers, nail polishes, insect repellents, etc.)

Now get them to discuss the benefits for use of such materials. Let them get further understanding of the benefits and consequences of synthetic materials.

Make three groups of the class. Assign each group one synthetic material— Plastics, Detergents, and Paints.

In the 2000 Sydney Olympics use of PVC (the plastic used in flooring, pipes, sheets, etc.) was completely avoided in stadium seating, floor covering and plumbing.

Each group has to collect information about

1. Uses of the (synthetic) material
2. Advantages
3. Disadvantages

Ask the entire class to brainstorm on alternative biodegradable materials or products that are less harmful to the environment.

Recap and Discussion

Discuss with students how they can help to cut down on use of synthetic materials. For example, students can make their own cleaning agent out of organic materials like vinegar etc.

Evaluation

Make a chart indicating uses of synthetic materials and the possible alternatives. For example, chemical fertilizers→ organic fertilizers, chemical pesticides→ biopesticides, synthetic fibres→ natural fibres like cotton, jute, etc., artificial flavouring agents→ natural flavours, synthetic dyes→ natural dyes.

Home Assignment

Ask students to come up with some practical suggestions on how use of synthetic materials can be minimized at home.

Activity 3

Do Not Burn!

Objective	:	To learn about the harmful effects of burning waste
Teaching Method	:	Discussion
Teaching Aids	:	Writing material
Group Size	:	Entire Class
Duration	:	30-45 minutes

Burning of waste produces ash residue which can contain toxic metals such as mercury, chromium, lead and arsenic. These can be toxic when ingested.

Introduction

Burning of unsorted waste is bad for the environment and bad for human health as the smoke causes air pollution. Burning of plastics is especially harmful as it generates a hazardous chemical known as Dioxin. The chemical goes up in the air with smoke and comes down to earth with rain, and contaminates soil and water. This chemical passes to cereals and vegetables grown in the soil and thus enters the human body when we eat these. Dioxins are toxic and can lead to serious health problems.

How to Do?

Ask students if they have come across waste (in schools, institutions, gardens and parks, and garbage dumping grounds) being burnt.

Let students list out reasons why waste is burnt. Their answers may include some of these reasons:

There is no assigned place to dispose of solid waste.

There is no solid waste collection system.

The waste need not be carried long distances for disposal.

Solid waste can spread and scatter around and make surroundings look dirty.

Burning of mixed waste helps to separate metal parts, which can then be easily picked up by rag pickers

Burning waste helps prevent scavenger birds and animals congregating at the garbage dump.

While burning of waste helps address some of these, it is important to understand the fact that burning solid waste merely converts solid waste into gaseous waste, and that it still remains a waste, and is the cause of another form of pollution—air pollution.

Recap and Discussion

Discuss with the class some problems with open burning of waste by examining and finding answers to these possible effects:

When we burn our garbage, where does the smoke go? Is that air pollution?

What happens when too much smoke and particulates get into the air? What will be the impact on human health? Does it impact the visibility in these areas?

What happens to the ash left after burning the waste? Could the heat given off while burning, be put to better use?

Explain one of the options for burning waste safely, and thereby reducing harmful effects on the environment, is to use properly constructed and operated waste combustors. These combustors have special controls to avoid polluting the air and the ash that remains is disposed of in a specially constructed sanitary landfill. Modern combustors also create energy through the heat given off when waste is burned. This energy can be used to heat homes or provide electricity.

The practice of burning of waste is harmful to human health and to the environment.

Evaluation

What are the other possible ways to reduce solid waste and the hence the problem of waste disposal? For example, leaf litter and other kitchen wastes can be composted; paper and cloth can be recycled and plastic and glass can be recycled. This not only reduces the volume of waste, but also helps in recycling much of the resource.

Home Assignment

Ask students if their household waste is composted? If yes, they must describe the process. (waste segregation, waste disposal, management of the compost pit, precautions to be taken etc)

If no, they should give reasons for not being able to do it (lack of information, lack of space, lack of time, reuse the wet waste as feed for animals, etc)

Activity 4

What's in the Air?

Objective	:	To help students estimate the extent of particulates in the air around them.
Teaching Method	:	Demonstration/Experiment
Teaching Aids	:	White sheets, petroleum jelly
Group size	:	Entire class
Duration	:	30 minutes and actual survey time

Introduction

Tiny airborne particles which are less than 100 micrometers are known as suspended particulate matter. These particles constantly enter the atmosphere from many sources.

Some of them include: exhausts from automobiles, burning of waste, industrial processes, and power generation. The particulate matter found in the air around us also includes soil particles, bacteria and viruses, pollen, etc.

Particulate matter refers to microscopic particles that are small enough to get into our lungs and which can cause numerous problems.

How to Do?

Ask the students to take two sheets of white paper and smear them with petroleum jelly on one side. They could try this either at home or at school.

Place these sheets on a window sill, or paste them on the outer wall of the building next to each other (side by side). The side with the jelly should be exposed.

Ask them to take in one sheet at the end of one day and to observe how dirty it looks compared with any other clean sheet.

Keep this dirty sheet in a safe place (for e.g. in a paper bag or between two blank/plain paper).

Take the other sheet in after a week. Ask the students to compare it with the first sheet. Is it dirtier than the first one? What does this suggest? How dirty is the air in their neighbourhood?

Recap and Discussion

Let each students describe the area they live in, think whether there is any air pollution, and try to identify a possible cause of particulates in the ambient air where they live.

Evaluation

After individual students have carried out the experiment at their home, all the results can be compiled in the class. Based on this, the students can list which areas of the city/localities have maximum air pollution and which have less.

Then take a map of the city, and ask students put labels on different parts to indicate the level of pollution. This can be done by colouring the labels with different shades of grey (light grey for least polluted to dark grey for most polluted).

Ask the students to collect leaves from different location, from gardens, streets, parks, school campus or any industrial site. Ask them to compare the dust accumulated on these leaves by observing the colour or the dust and its thickness by wiping it with finger. If there is any difference, they should try to find out the reason.

Home Assignment

Different students of the class could perform this activity in their own neighbourhood, and compare their observations in class. Which area/locality is more polluted? Why? Can they find out if there are any specific health problems in that area. Could these be linked with the air pollution?

Nearly 90 per cent of plastic water bottles are not recycled. They may take hundreds of year to decompose.

UNIT PLAN: Class VI

Subject: Science, Geography	Unit: Biodiversity
Duration 6 Class periods	**Concepts** • Living things around us • Plants and animals: form and function • Biodiversity as source of food • Where do plants and animals live

Instructional Objectives

Students will be able to :

- Identify living things and categorise them broadly.
- Recognize that living things have various physical characteristics that are helpful in identification and classification
- Relate that the food we eat comes from living things—plants and animals
- Appreciate that shape, size and form of various parts a living thing are so to serve a function.
- Relate living organisms to their habitat.

Previous Knowledge	Teaching Points
• The difference between living and non living things. • Characteristics of living things—how they move, what they eat, where they live, body parts, domestic or wild, etc. • A basic idea of the various foods that we eat and their sources. • Words that describe various shapes and their functions.	• What is the living world made up of? • What are the identifying features of plants and animals? How do such features help us in classifying them? • What is the source of food for humans and other living things? • Is there a relation between form and function as observed in various physical features of plants and animals?

Teaching and Learning Activities

Activity 1

Living Things Around Us

Objective	:	To observe living things in the surroundings.
Teaching Method	:	Game
Teaching Aids	:	None
Group Size	:	2 or 3 teams of about 15 students each
Duration	:	30-45 minutes

Introduction

We see many kinds of things all around—living and non living. There are various plants and animals around us. They are big, small and some are even invisible to the eye. Living things are found everywhere from large forests and oceans, to a single tree or puddle of water. There is great variety in living things – shape, size, colour, and behaviour.

This activity tests students' observation and classification skills in an active and enjoyable way. The activity needs to be conducted outdoors. It would be ideal if you could survey the site prior to taking students out so that you will be able to conduct the activity better.

How to Do?

Form two or three teams of the students. Ask each team to sit in a straight line. Each team should have a captain, who will maintain order in his team. The captain will also keep one member of his team ready to answer the call of the instructor. You can explain to them that the game is to listen carefully to the instructor and when the instructor calls "GO AND TOUCH....'., one member from each team kept ready by the captain rushes out to touch the named object, and after touching, returns to his seat. Whichever member reaches his/her place first gets one point. The others do not get any point. Then the next 3-4 members—one from each team - are asked to "GO AND TOUCH....." Members who have already gone and touched an article are asked to sit at the end of their line so that everyone in the team gets a chance to participate.

Planet Earth is home to between 5 million and 100 million species. Scientists have identified only 2 million species so far.

The instructor should ask students to "GO AND TOUCH" a variety of different living things that are in the vicinity. A living thing green in colour, a living thing red in colour, the bark of a tree, the leaf of a mango (or any other) tree, grass, water, stones, dried leaves, seeds, a flower, a plant, an animal, a fruit, food.

When every team member has participated, then the points won by each team should be totalled and whichever team has the highest score wins the game.

Recap and Discussion

Write down all the living things that the entire class observed on the blackboard. Keep adding to the list whenever any student calls out something new. Review the great variety in living things that were observed.

Discuss how trees and plants are living things that remain at one place. Insects, birds and animals can move and they live on or around plants.

Evaluation

Ask students to look at what they have listed and identify the smallest and the biggest animals and plants on their list. Try to classify these in different ways—e.g. plants and animals, by colours, by function, etc.

Home Assignment

Ask students to observe and list all the living things that they observe in and around any of the following areas:

House

Garden or park

In the waste dump/garbage heap

In a puddle of water

Repeat this observation exercise in different seasons to make it interesting.

Biodiversity forms the web of life of which we are an integral part and upon which we so fully depend.

Activity 2

Who Am I?

Objective	:	To help students in identifying animals based on their physical characteristics.
Teaching Method	:	Game
Teaching Aids	:	Name cards, paper clips or safety pins (prepare the cards referring to the list given on the next page)
Duration	:	30 minutes
Group size	:	Up to 40 players

Introduction

There are different types of plants and animals in the world. Many of them appear to be quite similar to each other. Others are quite different. While there is a tremendous variety of sizes, structures and functions among living things, there are also sufficient similarities to help them group into orderly patterns. This grouping is called classification.

Scientists have classified life forms in nature according to certain shared characteristics. These include the physical appearance, the food habit, the movement, and the habitat in which the organism is found.

Classification not only shows how organisms are related to one another but it also conveys much information about the living beings themselves. For example, when we learn that a cow is a mammal we know that a cow has hair, nurses it's young and has other characteristics similar to all other mammals.

How to Do?

Make the players stand or sit in a circle. Ask one player to volunteer. Fix a card on the back of the player such every one except the volunteer can see what the card is.

Ask the group to not read out the name on the card loudly and keep the suspense to see if the volunteer can guess what is on the card.

Now ask the volunteer to walk around the circle, so the other players can see what the card represents.

The task for the volunteer is to identify who he/she represents by asking relevant questions. The others must answer questions only with either a 'yes' or a 'no'. The player can ask up to a maximum of 5 questions.

Encourage students to frame questions logically on five aspects (not necessarily in the order given here) related to the animal:

- Where does it live? (water, tree, land etc)
- How does it move? (fly, swim, walk on two/four legs)
- Body parts: like tail, wings, gills, fins, horns, etc.
- What does it eat? (herbivore, carnivore, omnivore)
- Is it domestic or wild?

Provide the volunteer with a hint or two if need be to identify the animal.

Play the game such that all students get one chance each.

Recap and Discussion

How did the players arrive at the answers?

Which classification principles did they use?

Evaluation

After playing one or two rounds, introduce new animals to the list which may have some unique characteristics. See how students are using various identifying features to deduce the name of the animals in the game.

Home Assignment

Ask students to list 10 animals in their home/neighbourhood/school and write down their characteristics based on the questions given above.

E.g. Dog

- lives in my house
- has 4 legs, tail and a furry coat
- it walks and runs on four legs
- eats bread and milk
- is my pet

Suggested Animal List

Ant, Buffalo, Butterfly, Camel, Cat, Corals, Cow, Crab, Crocodile, Dog, Dolphin, Frog, Garden lizard, Goat, Lion, Mongoose, Monkey, Mosquito, Rabbit, Rhinoceros, Sheep, Snake, Spider, Tiger, Tortoise, Turtle, Whale.

India contains 5 per cent of the world's biodiversity on 2 per cent of the Earth's surface.

Activity 3

The Things We Eat

Objective	:	To enable students to identify the sources of different items of food.
Teaching Method	:	Survey
Teaching Aids	:	Writing Material
Group Size	:	Entire class
Duration	:	30 minutes

Introduction

It is because of the diversity of living things that we get to eat so many varieties of foods: crops, livestock, poultry, and fish. These are important foods for humans world over. Because of plants and animals, we get to eat thousands of food products, such as, fruits, vegetables, nuts, honey, meat, milk and so on. These become the raw materials for a variety of processed products like breads, chocolates and biscuits, sugar etc.

How to Do?

Ask the students who among them has eaten roots. The student answering should name the plant whose root he has eaten, and in which form.

Similarly ask about other parts of plants like stem, bark, leaves, flowers, fruit, seeds, which are eaten as food. These answers could be listed on the blackboard.

Students should then be asked to answer whether particular items are eaten raw or cooked—and if cooked to name the dish which is made using that thing.

They should further classify the plants into trees, shrubs, herbs, creepers, etc.

In the subsequent session each student should bring to class a variety of edible roots, leaves, seeds, etc. These can be labelled and displayed in the class.

Recap and Discussion

What if we just had to eat rice or wheat and no other food? Would it make a balanced diet?

Would it be interesting to eat only one type of food everyday?

---

90 per cent of the world's food comes from 20 plant species.

Evaluation

What is the food eaten by commonly seen animals around? Where does that food come from? Are students able to deduce that it is the variety of living things that provides food not only for humans but for other animals as well?

Home Assignment

Ask students to take one processed product (biscuits, chocolates, bread, noodles, cakes etc). They should look carefully at the packet and note all the ingredients that are used to make that item.
Next to each ingredient, they should write the source of the thing.

E.g. Ingredient → Source: Flour→ Wheat, Sugar→ Sugarcane

Activity 4

Leaf Forms

Objectives	:	To appreciate the great variety in plants and leaves, particularly their shapes and textures.
Teaching Method	:	Field Visit, Art
Teaching Aids	:	Leaves from different plants, sheets of paper, crayons, colour pencils.
Group Size	:	Individual
Duration	:	30 minutes outdoors, 30 minutes in classroom

Over 25 per cent of our medicines are derived from plants.

Introduction

Leaves come in a great variety of shapes, sizes and even colours. A leaf has many functions. It prepares food by trapping sunlight. So its form is flat so that it can trap as much sunlight as it can and maximize photosynthesis. Some leaves have spines to keep predators away. Some have a waxy coating to stop water loss through transpiration.

How to Do?

Ask students to collect leaves from their surroundings. They should preferably not pluck the leaves, but pick up fallen leaves.

Let them group these leaves according to their respective edges — Spiky edges; Wavy edges; Smooth edges, etc. Also let them note the texture of the leaves – smooth, waxy, velvety, etc.

Now ask students to select one leaf and take its "autograph" in the following way:

- Place the leaf on a notebook with its lower surface, on which the veins are prominent, facing upwards.
- Place a sheet of paper firmly on the leaf and rub over the leaf with a crayon. The impression or the 'autograph'of the leaf will appear on the paper.

Recap and Discussion

Students can display their leaf autographs, along with the name of the tree/plant to which it belongs.

Discuss how the shape of leaves helps to identify the tree or plant.

Bring a few leaves of common plants and show these and ask students to tell what plant they belong to.

Evaluation

Ask students how the shapes and texture of leaves may be related to the kind of weather conditions in which the plant grows, e.g. rainy, dry, cold etc. For example plants that grow in water have waxy "waterproof" coating, while desert plants have very small leaves.

Home Assignment

Ask students to observe a commonly found item like a fan or a tumbler and ask them to describe if such a shape is found in any object in nature like leaves, flowers, shells, etc.

Vegetation absorbs noise. Trees are able to reduce the noise level by 6-8 decibels for every 30m of tree cover.

Activity 5

Habitat Inhabitants

Objective	:	To learn that diverse habitats support basic needs of different living things.
Teaching Method	:	Game
Teaching Aids	:	Chart paper and sketch pens for making Habitat Inhabitant cards
Group Size	:	Entire class
Duration	:	30 minutes

Introduction

Plants, animals and humans all have basic needs of food, water, shelter and space. Habitat is a place where a particular plant or animal lives. A habitat provides an animal with adequate food, water, shelter and living space. A suitable habitat provides the place for a plant/animal to live, grow and reproduce naturally.

In this activity students will try to match the different living things to their suitable habitat.

How to Do?

In the four corners in a large room, mark areas for different habitats— for example, Wetland, Soil, Forest, City, etc. The habitats can be marked on the floor with chalk, or they can be simply pointed out to the players.

Prepare Habitat Inhabitant cards. For this cut thick chart paper into approximately 9cm x 5cm (or use the blank side of visiting cards, greeting cards, etc.). Write the names in bold letters, one on each card. A sample list of inhabitants of some habitats is provided. It would be ideal to use local examples of plants and animals as students would easily associate with them.

Ask the players to stand in a circle at the centre of the room. Distribute the Habitat Inhabitant cards to the players, at random.

Start clapping or playing some music. The players should pass the cards around in the circle, i.e., give their card to the player on the right and take the card from the player on the left, for as long as the music goes.

When the music stops, the players look at the card they have in their hand, and run to the habitat where they think the plant or animal named in the card belongs.

Trees and plants are able to reduce the temperature of an area by as much as 10°C.

Go to each habitat and find out why the student thinks he/she belongs there. What does the habitat offer the animal or plant? What are the basic necessities of the animal/plant? Does the habitat provide all those basic necessities?

Recap and Discussion

How are different plant and animal inhabitants in each habitat inter-related? Discuss how habitats can be very big – like a forest or an ocean. But even a single tree can be a habitat for numerous living things.

Evaluation

Ask students to tell what are some reasons that could harm or destroy each of the habitats? How would each of the inhabitants be affected?

Home Assignment

Let students observe and list the plant and animal species that have made their home near or in their house (plants in the garden, insects in the house, etc.). How does the house or garden provide these with their basic requirements (food, water, shelter/space)?

Habitat Inhabitant Card Names

Wetland/Pond	Forest	Town/City	Tree
Dragonfly	Ant	Acacia	Ant
Duck	Butterfly	Bandicoot	Fungus
Egret	Elephant	Buffalo	Babbler
Fish	Fox	Kite	Barbet
Frog	Langur	Cow	Beetle
Grey Heron	Mongoose	Crow	Bug
Kingfisher	Owl	Donkey	Bulbul
Lotus	Peacock	Gulmohar	Butterfly
Moss	Snake	Human being	Caterpillar
Painted stork	Spider	Lizards	Creeper
Pond skater	Spotted deer	Monkey	Crow
Snail	Tiger	Mosquito	Dove
Spoonbill		Neem	Honeybee
Turtle		Rat	Parakeet
Water hyacinth		Sparrow	Spider
		Spider	Squirrel
			Woodpecker

The best way to protect species is to protect the ecosystems in which they live.

UNIT PLAN: Class VII

	Unit: Biodiversity
	Concepts • Animals are useful in many ways • Percolation of water • Seed dispersal • Functions of seeds • Adaptations of animals • Importance of forests

Instructional Objectives

Students will be able to :

- Identify the numerous animals that are part of our life in many ways.
- Demonstrate the role of vegetation in soil and water conservation.
- Appreciate the variety in seeds, and ways of seed dispersal.
- Understand how adaptations help animals to live in specific climatic and physical conditions.
- Appreciate the importance of forests.

Previous Knowledge	Teaching Points
• Animals are a source of many foods and other items. • Living things in different climatic conditions have different features. • Many plants produce seeds. • Seeds of different plants have different characteristics. • Seeds grow into new plants.	• What are the benefits that we get from animals? • How do plants help in percolation of water? • How do seeds of different plants vary in their characteristics? • How do seeds get dispersed? • How are animals and plants adapted to different climatic conditions? • Why are forests so important?

Teaching and Learning Activities

Activity 1

Animals in our Lives

Objective	:	To make students aware of how animals contribute to our lives in many ways.
Teaching Method	:	Observation, expression
Teaching Aids	:	Writing material
Group Size	:	Entire class
Duration	:	30 minutes

Introduction

Animals help humans in many ways. They provide food for us in the form of milk products, poultry, meat or fish. Fur, hide, leather, bone and various other animal products are put to use for clothing by us. Animal dung is a source of fuel for many communities. Some do work for us—horses and donkeys carry burden and draw carts, cows and ox are used in farming, dogs help policemen in their job. Some animals are kept as pets, are used in medical research and testing.

These are the more obvious uses to humans. Animals have an very important role in maintaining the balance in ecosystems. They pollinate and fertilize plants, they have their places in the food chain that helps to keep the ecosystem healthy.

Some animals can be beneficial in controlling harmful animals and plants — weed eating goats, ladybugs eating aphids, etc. Snakes keep down rodent and insect populations that can transmit harmful diseases to humans.

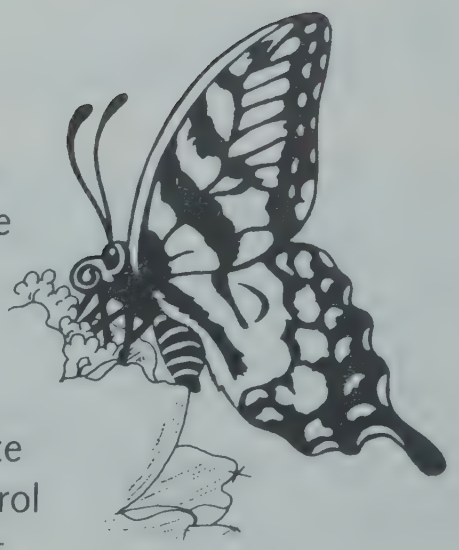
How to Do?

Start by discussing insects with students. The students may be taken out to a garden or a playground and asked to observe and identify some insects.

After this introduction, ask each student to think of an insect and also say why he/she likes or does not like the insect he/she has chosen.

As an example, one student may say:
"I do not like mosquitoes because they bite." or
"I do not like houseflies because they sit in dirty places".

Another student may say: "I like butterflies because they are pretty."
Or a third: "I like honeybees because they make sweet honey."
Try that each student should name a different insect. Encourage students to think of insects that they may not notice, but that affects them in some way (bedbugs, lice, etc.)



Recap and Discussion

Discuss the usefulness of insects and the harm some of them may cause. Some insects help in pollination, like bees, butterflies, etc. Some like the praying mantis and the dragonfly feed on other insects and thus control the insect population. Many insects like butterflies are beautiful to look at. Also discuss how insects are one of the most important parts in food chains.

It is important to get students to think about the less visible animals and the less obvious but critical role they play in the environment.

Ask students if they have seen insects in this way before. Animals not only play different roles in the environment, they also provide inspiration for art, literature and performing arts.

Evaluation

Write the benefits obtained (directly or indirectly) from animals (including insects, reptiles, birds) under the following categories:

1. Economic benefits
2. Nutritional benefits
3. Contribution to culture and arts
4. Benefits to other plants and animals

Home Assignment

Ask students to carefully observe and note all the different types of animals that can be found in their houses — especially the smaller, less obvious ones like ants, lizards, etc. Let students find out how these animals are of help to them, directly or indirectly.

Teaching a child not to step on a caterpillar is as valuable to the child as it is to the caterpillar. *Bradley Millar*

Activity 2

Protective Cover

Objective	:	Demonstrate the role of vegetation in arresting soil erosion.
Teaching Method	:	Experiment
Teaching Aids	:	Two plastic trays, a piece of tin sheet for spout, brick pieces, pebbles, ordinary soil, mustard seeds, two glass jars (one litre capacity).
Group Size	:	Entire Class
Duration	:	30 minutes to set up the experiment, and 30 minutes for discussion

Introduction

Topsoil is a precious resource. It supports flora and fauna. It helps water to percolate. This precious cover is extremely slow to form, but it can be destroyed quite fast. Just a thin layer of soil can take centuries to develop (it takes 100–2,500 years for a 2.5 cm of topsoil to form.), but if mistreated, can be blown and washed away in a few seasons.

Bare soils are prone to wind and water erosion. The ability of such soils to retain water, and let it percolate is poor. Growth of vegetation on soil provides a protective cover for the soil. Its roots hold the soil and the leaves protect the soil from direct impact of wind and water.

How to Do?

Ask students to take two plastic trays approximately 90 cm x 50 cm x15 cm. They can improvise and use corrugated boxes/cartons as trays, lined with polythene sheet to make them leak proof. These sheets could be made by cutting open old plastic bags and fusing the edges together with the help of a candle.

At one end of each tray cut a 'V' notch 10 cm deep and fit it with a tin spout to allow runoff water to flow out.

Ask them to fill each tray with 3–4 cm layer of brick pieces and pebbles, followed by 3–4 cm layer of ordinary soil, followed by 3–4 cm layer of manured soil. They must sow mustard seeds or any other quick growing seeds in one tray. Leave the other tray bare. Sprinkle water regularly, so that the seedlings do not wilt away and are 8–10 cm high. This may take a few days.

Nature is, in sum, an intricate web of life whose interwoven strands lead from microbes to man. — *Rachel Carson*

Now set the trays on a low table so that the spouts extend over the edge. Place a prop (a piece of brick, etc.) at one end to give them slope. Place empty glass jars beneath the spouts.

Now ask students to water both the trays. Equal but generous amount of water should be poured in order to observe the effect of a sudden rain/downpour)

Recap and Discussion

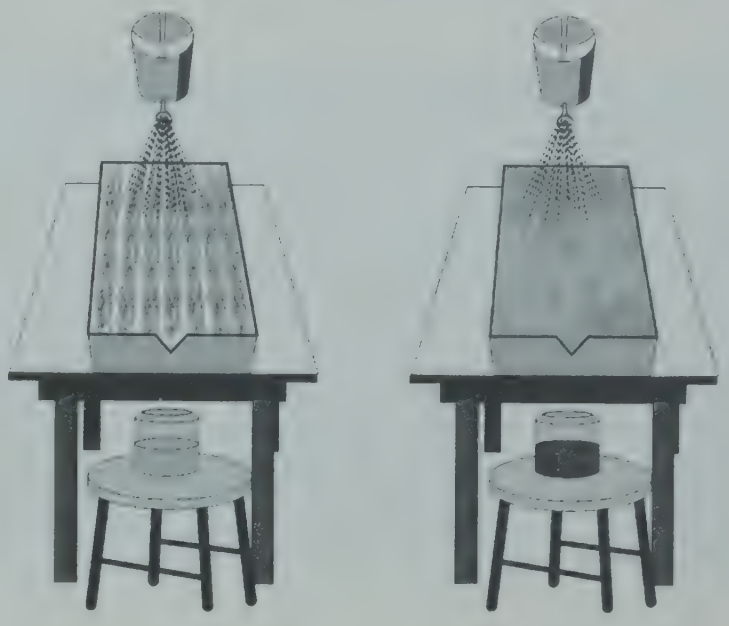
Let students observe and compare:

1. From which tray the water comes out first.
2. The rate of water flow from both the trays.
3. The quantity of water that runs off from both the trays.
4. The quality of water (which one is muddier?).

Why is it that the amount of water that flows out from the vegetated tray is less than that from the bare one?

How does vegetation help in reducing soil erosion?

Why is it necessary to cover and protect the soil by natural means?



Experimental setup to see the role of vegetation in arresting soil erosion.

Evaluation

Ask students to write 5 lines on the benefits of planting trees.

Home Assignment

Ask students to observe any plot of land near their home (vacant plot, park, parking area, etc.). Let them note: Is there any vegetation on the site? What kind of vegetation – grass, trees, weeds, etc? Is the site bare? Is it paved? After it rains, is there water logging on or around the site? Why does this happen, or not happen? Do they think there could be any link with the plant cover?

Soil is not produced overnight. A fertile soil layer takes nature many centuries to create.

Activity 3

Floating in the Air

Objective	:	To see how light objects float in the air and understand how some seeds are dispersed.
Teaching Method	:	Experiment
Teaching Aids	:	Paper, balloon, feather, pebbles, stones, cotton wad, leaves, ball, etc
Group Size	:	Individual
Duration	:	30 minutes

Introduction

All plants need enough sunlight, water, minerals and space to grow well. It is important that the seeds of plants reach places far from the parent plant, so that new plants can grow and spread. Nature has provided many ways by which seeds and fruits are carried to different places – by wind, water, and animals. The form and features of different seeds are suited to their mode of dispersal.

How to Do?

Ask students to collect the required materials. Select a location about 3-4 metres above the ground, e.g. the terrace of first floor of the school building or a house. Ask one student to go up and drop the materials one by one — paper, balloon, feather, pebbles, stone, cotton wad, leaf, etc.

Ask the others to observe the flight of these objects, and note which of these take a straight path, and which float in the air and reach the ground in a zigzag manner.

Then ask the student to take two identical pieces of paper and crumple one into a ball. And now make a student drop these from a height. What is the relationship of shape to the ability to float in the air?

Seeds are great travellers. They travel far and wide in different ways– fly, float, burst open, even ride piggy back!

Recap and Discussion

Explain now to the students how certain flowers/seeds have structures and features which help them to get transported by wind and thus get help them reach a suitable place for germination. Ask if students have seen very light cotton wool like things floating in the air. Tell them that these are one kind of seeds which are being carried in the breeze. Ask them if they have ever found some seeds sticking to their socks or clothes after a walk in a field or wooded area.

Discuss some other ways by which seeds get dispersed – floating, attaching themselves to animal fur, feathers or feet; getting excreted by animals who eat the fruit, etc.

Evaluation

Ask students to say how the seeds of these naturally get dispersed: Coconut, mango, cotton, drumstick, neem, lady'sfinger, etc.

Coconuts float on water. Mangoes are eaten by people and the seeds are thrown. Cotton seeds are dispersed by the wind. Drumstick seeds have wings to help them glide in the wind. Neem fruits are eaten by birds and the undigested seed comes out with the droppings. Lady's finger burst when dry and let out the seeds.

Home Assignment

Ask students to collect 5 seeds/fruits from plants around the school premises. Study their characteristics and guess how they get dispersed.

Activity 4

Seed Bank

Objective	:	To familiarize students with the large variety in seeds.
Teaching Method	:	Collection, Display
Teaching Aids	:	Material/containers for display of seed samples
Group Size	:	Entire class
Duration	:	60 minutes

Today's mighty oak is just yesterday's nut that held its ground.

Anon

Introduction

All things in nature — big and small — have a purpose. Seeds are produced by plants for reproduction. Seeds serve several functions for a plant that produces them. The plant provides nourishment to the seed when it is germinating into a new plant (until the root and shoots are formed for the plant to produce its own food). With enough warmth and moisture the seed germinates and begins to sprout. Each seed a store of food to feed the seedling as it grows. Seeds are hidden in fruits. Some fruits have a single seed, while some have many.

How to Do?

Ask the students to collect different types of seeds (of fruits, flowers, and vegetables, as well as cereals, pulses, etc.). These could be collected from home, kitchen, gardens, nurseries or plantations.

Ask them to observe, and classify the seeds according to shape, size, colour, and the location from where the seeds were collected.

Initiate a discussion on the ways in which the classification can be done.

Students could create a "display corner" of the seeds after they properly classify and catalogue them.

You could ask the students to exchange seeds or give them to people who want to raise plants/trees from them.

Recap and Discussion

Ask students to collect few seeds of each variety and divide them into two parts. Drop one part into a container with clean, cool water. This should be kept undisturbed for four hours. The soaked seeds should be compared with the dry seeds. They can observe that the soaked seeds will be bigger and the seed coat may be wrinkled or broken. Discuss the reasons.

Evaluation

Ask students to sow different seeds (mustard, methi, coriander, etc) in small suitable containers with soil in at home and bring them to the classroom. Keep the containers in a place which receives sunlight. Ask students to observe and make notes for one week. They should note how many days it takes the seeds to germinate. Compare how different seeds germinate (e.g. time taken by different varieties of seeds to germinate), how the leaves and the roots develop, etc.

Article 51(A)(g) of the Indian constitution imposes a constitutional obligation on the citizens of India to protect and improve the natural environment, including forests, lakes, rivers and wildlife and to have compassion for all living creatures.

Home Assignment

Ask students to list all the different seeds that are found in their kitchen and home. They must also note for what purpose the seed is used (for adding spice to cooking, for certain food dishes, etc.). They should find out the source of the different seeds.

Activity 5

Animal Adaptations

Objective	:	Describe adaptations in some animals that help them live in a desert.
Teaching Method	:	Game
Teaching Aids	:	Chart paper, crayons or sketch pens, slips of paper
Group Size	:	Groups of 8
Duration	:	30 minutes

Introduction

Animals that live in different climatic conditions have a variety of ways of coping with challenges of the climate. Animals living in hot and cold deserts, mountain ranges, oceans and other aquatic habitats exhibit a range of physical and physiological features that help them survive in their given climatic condition. This is described as adaptation.

How to Do?

Discuss briefly the climatic and physical conditions of a desert – extreme heat in the daytime, cool nights, lack of vegetation, sandy or dry soil, etc.

This game can be played by eight students at a time. Make a set of the Animal Adaptation Clues. Copy each clue onto a separate slip of paper (Do not include the names of the animals on the slips). Then mix up clues and put them in a common place.

Ask each student to pick up three clue slips. Now tell the students to share the clue slips and try to find three clues that together describe the characteristics of one animal. For example, a student with a clue about a hump can look for someone with a clue about long eyelashes to keep out sand. Finally the 3 students with camel clues get together to form a team.

The diversity of life forms, is so numerous that we have yet to identify most of these and this is the greatest wonder of the planet.
E.O.Wilson

On one side of the room, put up 8 large signs each with the names of one animal (you could also put up an illustration). Tell the students that after the 3 clues have come together, they should identify which animal the clues describe and put up their clues next to the correct sign. The objective of the game is to be the first team to correctly fit the clues to the animals described. (You can add a little excitement to the game by setting a time limit.)

Recap and Discussion

Ask students what were some of the features of the animals that made it possible for them to live in the desert. Discuss some of these adaptation strategies with reference to the animals.

Animals in the hot and dry deserts are used to the dryness. They usually get their water from the food they eat. The diet of the animals changes from season to season—during the wet season leaves and flowers are available and in dry periods probably it is only seeds and other insects that are found. Large animals in a desert travel long distances to get water. Other small creatures hide during the day when it is hot and come out during nights to find their food. Many give birth to young one only when it rains. Many seeds do not germinate and wait until the right time comes. Animals like the camel use fat as a source of energy. Some animals have large ears to cool their body. Some animals like the spiders and scorpions have thick body coverings to not allow any water to pass through the animals.

Evaluation

Mix up the clue slips again. Give each team three of the adaptation clues from the activity. Then tell them that they have to create an imaginary animal using the three clues. The students should decide what their particular animal look like, how it get its food and water, how it escapes predators, how it beats the desert heat, and anything else they want to focus on. Have them draw pictures of their 'new' animals in their habitats, and then have each student present his or her animal to the rest of the group.

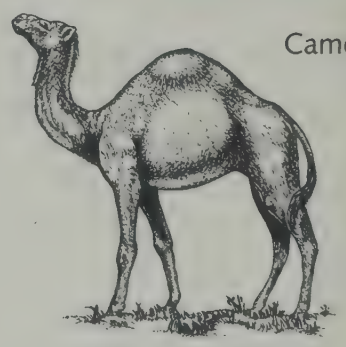
Home Assignment

What are some ways in which human being adapt to extreme heat and cold conditions?

Animal Adaptation Clues

Camel

- I walk on the pads of the feet, not the hooves.
- I have a hump on my back that stores fat because of which I can go without food for long periods.
- I have long eyelashes, and hair inside the ear and nostrils that protect me from sand.



Camel

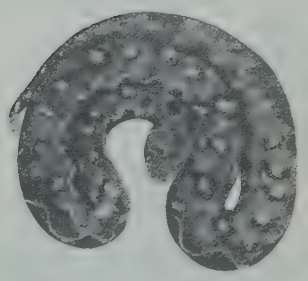
Antelope Rat or Indian Desert Gerbil

- My hind legs help me jump straight up into the air, out of danger's way.
- I eat a lot of seeds and never need to take a drink of water.
- I use my long tail for balance when I jump.

Antelope Rat/
Indian Desert Gerbil

Biodiversity is life in all its dimensions, and richness and manifestations.

Saw-scaled Viper


Saw-scaled Viper

- I move sideways over the sand using my strong muscles to move in an S curve.
- The rough scales on my underside dig into the sand and help me move fast.
- Only two points of my body touch the sand at any one time, so I stay cooler.

Desert Hare

- During the day I lie still in a patch of grass or in a hollow area. If disturbed I bo run for a short distance, then stop to sit up and look around.
- My big ears radiate heat and help me to keep me to keep my body cool.
- I do not need to drink water, but get moisture from the shrubs and grass that I eat.

Desert Hare

Scorpion

- I capture insects and other small prey with my large claws.
- One sting from my tail and my prey cannot move a muscle.
- If I am a female, I carry my young on my back.

Scorpion

Indian Gazelle (Chinkara)

- I can go without water for long periods. I get moisture from the fruits I eat and from dew.
- I come out in the evenings and rest during the day.
- My long legs help me to keep the rest of my body away from the hot ground.

Indian Gazelle

Grey Partridge

- I am plump with a stub tail.
- I ama very fast runner and also a swift flier.
- I scratch the ground or cattle dung for my food of grain, termites, or beetle larvae.

Grey Partridge

Long-eared Hedgehog

- I shelter during the day in holes in the sand or beneath thorny bushes. I come out to feed at dusk.
- I have a dense mat of spines which cover the back and sides and if handled, I throw back spines with a jerk to drive in the spines.
- I have long pointed ears that help me cool in the heat.

Long-eared Hedgehog

A physical adaptation is a feature on an animal's body that makes the animal better suited to its habitat.

Activity 6

Forests for Life

Objective	:	To share an inspiring story about forests and conservation.
Teaching Method	:	Story Reading and Comprehension
Teaching Aids	:	Writing material
Group Size	:	Entire class
Duration	:	30 minutes

Introduction

What difference will one tree less or more make? This is what we often think, as we hesitate to plant or protect trees. Here is the true story of one man and his dream to green the earth; and of a lifetime spent in making this dream come true. A lesson that with a vision and with determination even one person can make a difference.

How to Do?

Read aloud the story 'Man of the Trees' to the students. If possible distribute photocopies to each student or small groups of students.

Ask students to answer the following questions:

- Who were the friends that the young Richard felt happiest with?
- What is silviculture?
- Why were people cutting trees in Kenya?
- What are the 3 main things that we need for survival. How do trees give us those?
- Why did Richard say that if we do not have trees life will disappear from the planet?

Recap and Discussion

Ask students what they felt about the story. Why is it important for every person to take responsibility for conserving our natural resources?

Home Assignment

Ask students to find out about the Chipko Movement and the Silent Valley Movement. Do they know of any other case where people have worked together to protect natural resources like forests?

One full grown tree neutralizes the CO_2 output of one person.

Evaluation

Write a short poem about trees or forests.

Man of the Trees

A five-year-old boy once found himself lost in the forests near his home. As he wandered through the thick greenery with a leafy canopy over his head, he forgot that he was lost, he forgot to be afraid. He felt that he was among friends. He felt the peace and majesty of the green world. He had an experience that would mark the path that he would take for the rest of his life. Many years later he wrote "I had entered the temple of the woods. I sank to the ground in a state of ecstasy."

The boy's name was Richard. He spent his infancy and childhood in the company of trees. He worked with his father in the garden and nursery, and on the plot of land his father gave him for growing trees. Young Richard would spend hours in the forest near his home in the company of his tall, quiet friends. His parents often thought that he was lost. Gradually they stopped worrying because they knew that Richard would be wandering among his beloved friends.

At the age of 10, he wrote his first essay on trees. As he left school Richard went to Canada. Working at a number of odd jobs, he earned enough to study silviculture (the science of planting and growing trees) at the University there. So the childhood love for trees grew into proper study of the subject.

After completing his studies, Richard took up his first job as a forester in far-off Kenya. He arrived on the new continent with visions of making friends with the forests of Africa. But what he saw, was that people were destroying the forests in their haste to clear land for fields and towns, and for that the cut trees would fetch them money.

Young Richard was shocked and shaken. For him it was like seeing Mother Earth being skinned alive. He felt that at that rate, the earth's very life was in danger. He reasoned

The wealth of the nation is its air, water, soil, forests, minerals, rivers, lakes, oceans, scenic beauty, wildlife habitats and biodiversity... that's all there is. These biological systems are the sustaining wealth of the world. *Gaylord Nelson*

that if a person loses one-third of its bark, the tree will die. If the world loses one-third of its trees, the world will die.

There was no time to lose. Richard felt that he had to do something to heal these wounds, and that was to plant trees. In 1992, he set up an organization in Kenya called Men of the Trees to do just that. Today this organization has branches all over the world.

Thus a young boy's love for trees and a young man's study of trees came together into a lifelong mission to conserve, save and protect trees. Richard grew up to be Richard St. Barbe Baker. In Kenya where he spent many years as a forester they called him Baba Way Miti, the affectionate Father of the Trees, or Bwana Way Miti-the Master of the Trees. In Australia they named him king of the Trees, and in California, the Saint of the Redwoods. Today, world over, he is simply known as the Man of the Trees.

St. Barbe often said, "We live less than five minutes without air and trees give us the air we breathe. We live less than five days without water, and trees are absolutely essential in the water cycle. We live less than five weeks without food and without trees we cannot grow food."

His message was simple "If we continue tearing away the earth's green cloak at the rate that we have, we soon won't have enough trees to provide the oxygen we need to survive, and life will disappear from the planet. All that's required is some intelligent stewardship. It's a world-wide responsibility."

Till he died in 1982, at the age of 93 years, this Pied Piper of trees continued to travel around the world, with this simple message. At the age of 88, he went to the Himalayas to bless the famous Chipko movement which was to protect trees and natural resources. At the age of 91 he said that he would go on a fast-unto-death to protest against the threat of Silent Valley, one of India's tropical rainforests.

Through his life St. Barbe dreamed of an international network of young people healing the planet through tree planting. He said, "I have the dream of earth made green again, an earth healed and made whole by the efforts of children. Children of all nations planting trees to express their special understanding of the earth, expressing and celebrating their understanding of all children as their brothers and sisters."

(Based on the life of St. Barbe Baker)

A single tree in the tropics can have more than 1000 different kinds of insects living on it at one time.

UNIT PLAN: Class VIII

Subject: Science, Geography	**Unit:** Biodiversity
Duration 7 Class periods	**Concepts** • Crops, production and management. • Microorganisms in soil. • Interdependence and balance in nature. • Need for conservation of resources.

Instructional Objectives

Students will be able to :

- Understand the variety of crops grown in the region.
- Analyse how and what kind of inputs go into agriculture.
- Observe that soil has many small organisms living in it.
- Relate that all biotic and abiotic components are interconnected and interdependent.

Previous Knowledge	Teaching Points
• Humans require large quantities of rice/wheat/maize, pulses, fruits and vegetables as food. • These are grown in crops and brought to the market. • Plants require water, soil and sunlight to grow. • Many small animals live in soil. • All animals require food and water for survival.	• How is our food produced? • What is needed to grow crops? • Where can we find small organisms? • Why is it important to conserve all living things, and resources like water and soil?

Teaching and Learning Activities

Activity 1

Know Your Crops

Objective	:	To encourage students to observe and collect information about farms and crops of their region.
Teaching Method	:	Field trip and Survey
Teaching Aids	:	Map of India
Group size	:	5–6 students
Duration	:	Half a day (preferably when farming activities take place)

Introduction

Plants when grown at a place on a large scale are known as crops, and the process is called agriculture. Agriculture is a very old practice and it, in fact, allowed the human population to transform from nomadic communities to settled communities. Today, food has to be provided for a large population and hence it requires regular production, proper management, efficient distribution etc.

How to Do?

Take the students to nearby agricultural fields (preferably in different seasons).

Let students observe carefully and what is growing there.

They should try and collect as much information as possible by talking to the farmer/owner of the field.

The questions to be asked could include:

1. What is the crop that is planted?
2. What is the crop used as (cereal, fodder, oilseed, etc.)?
3. Why is this particular crop planted?
4. What else do they plant/grow in their field?
5. When is the crop planted (season, months, etc.)?

We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect.

Aldo Leopold, A Sand County Almanac

6. What preparations are necessary before planting the crop?
7. Where are the seeds obtained from?
8. How do farmers preserve the seeds?
9. What part of the crop is useful? What are the uses of different parts?
10. What do the farmers do with the remaining parts of the plants?

11. Where does the water needed for the crop come from?
12. What fertilizers are used (natural or chemical), how often?
13. What are the crop's major pests?
14. What pesticides are used? Is any other method of pest control used?
15. When is the crop harvested?
16. How much yield is expected per hectare or part thereof?

Recap and Discussion

Discuss how we think we eat so many plants as part of our food. In fact, students will be surprised to learn that of the 30,000 species of plants that are known to have edible parts, only 7000 kinds have every been cultivated or collected as food. Even out of those 90% of the world's food is provided by 20 species of plants. Of those three species supply more than half the world's food. These are wheat, rice and maize.

Evaluation

Give three important points that a farmer would need to consider when deciding what to plant?

Home Assignment

Students can find out from parents and grandparents about some cereals, fruits and vegetable that we eat now, but that were not eaten by them when they were young. They should discuss at home the reasons for this.

It is estimated that by the year 2050 upto one in every four plant species will become extinct or nearly extinct.

Activity 2

Reaping What You Sow

Objective	:	To help students understand the factors influencing choices made by farmers while growing their crops.
Teaching Method	:	Game
Teaching Aids	:	One Farmer's Card for each of the groups, papers and pencils, data sheet for each group or data displayed in a way that all groups can see it easily from where they sit.
Group size	:	Groups of 5-7
Duration	:	45 minutes

Introduction

What crop to grow in a particular region depends primarily on the physical environment such as climate and soil. Within these physical limits, the types and methods of farming are determined by socio-economic considerations. Some of the factors which influence the agriculture produce are: size of farm, ownership of land, availability of capital and labour, cost of production, market demand, government support policies and subsidies.

Preparation

For this activity, prepare the following materials:

Farmer's Cards: Cut a piece of chart paper into cards. The dimensions of each card should be approximately 10 cm x 15 cm. Write the following paragraphs, one on each card:

Farmer 1: You are a poor farmer with one hectare of land. Agriculture on this land is your only source of income. You do not own any livestock. You live in a dry area and are totally dependent on the rains for agriculture. There are six members in your family.

Farmer 2: You are a poor farmer with one hectare of land. You also own two cows and four goats. Produce from the land and the livestock is you only source of income. You live on the plains close to a perennial river, which is the main source of water for irrigation. There are two members in your family.

It is estimated that between 50,000 to 60,000 varieties of rice were grown in India, not so long ago.

Farmer 3: You are a farmer with a medium sized land holding of two hectares of land. You also own three cows. The produce from the land and from the livestock are the main sources of your income. You live in an arid area where the availability of water for irrigation and fodder for cattle is a perennial problem. There are eight members in your family.

Farmer 4: You are a farmer with three hectares of land and four goats. You also have a small business. Both agriculture and business contribute to your income. You live in a fertile, well irrigated area. There are six members in your family.

Farmer 5: You are a farmer with six hectares of land. You do not own any livestock. You have a profitable business in a nearby town. The business is the major source of your income, while agriculture is a secondary source. your fields are irrigated by water from a canal close by. There are five members in your family.

Data sheet: Write the following data on the blank side of each farmer card or on a large sheet of paper and display it at a place where all participants can see it from where they sit.

Data Sheet		
	Seed Varieties	
	Variety A	**Variety B**
Yield (kg/hectare)	3300	4700
Water demand	12 units	36 units
Fertilizer requirement	50 units	90 units
Pesticide requirement	30 units	20 units
Grain:Straw ratio*	1:6	1:1

(*Grain:Straw ratio is the ratio of the amount of grain produced to the amount of straw produced. The ratio 1:6 means that for every one unit of grain that is produced, 6 units of straw is produced. The ratio 1:1 means that for every one unit of grain that is produced, one unit of straw is produced. Straw is used for feeding livestock.)

How to Do?

Divide the students into five groups of about 5-7 students each. Give each of the five groups a different farmer's card.

Tell them that they are farmers who have to make a decision on the kind of seeds that they will sow. Display the data for all the groups to see.

An estimated 45,000 species of plants are found in the Indian region (including flowering and non-flowering plants such as algae, ferns, and fungi.

Tell them that as farmer they need to keep the following in mind while making their decisions:

Yield of the crop: Their choice will depend on: the number of members in their families, whether they would like to market their produce, if agriculture is the only source of their income, etc.

Water, fertilizer and pesticide demand: All of these will require investments to be made.

Straw production: Their choice will depend on the number of livestock they possess and their ability to buy animal feed if required.

Sustainability: Their choice will depend on their perception if they can continue farming in the same manner in the future. For example, if they choose a variety which needs more water than is naturally available in the area, irrigation may be required. Irrigating an arid area may cause the soil to become saline over a period of time and become unproductive.

They have 15 minutes to make the decision and to list down the reasons for taking the decision.

At the end of fifteen minutes, ask each group to present their decisions and the reasons behind the decisions. The reasons should not be just the data already given for the seed varieties, but they will need to expand on this. For example, a statement which says 'We choose the Variety A because it requires 50 units of fertilizer is not valid. The groups have to say something like 'We choose the Variety A because it requires 50 units of fertilizer. We feel we cannot afford to buy the 90 units of fertilizer that the Variety B requires.'

Recap and Discussion

For each group of farmers, the factors which govern their decisions may vary. While the yield of the crop and the profits that can be made from the produce may be a common consideration, other factors which influence the decision will be the investments the crop demands, irrigation requirements, by-products that sustain livestock, inputs like chemical fertilizers and pesticides it needs, etc. Discuss how there may be no "right" or "wrong" choice. The choices are affected by a number of factors which may differ from situation to situation.

Evaluation

Ask each student to imagine how agriculture would be affected in the following situations.

- no rains or water availability in the sowing seasons
- rains and floods during harvest season
- attack of pests in spite of using pesticides
- no electricity
- no buyers to buy the produce.

Home Assignment

Ask students to find out about organic farming and write about it. How does it differ from the traditional agricultural practice? What are the environmental and health benefits of organic farming?

Scientists believe that at least 166 species of crops originated in the Indian sub-continent. This includes rice, mango, cow pea, cucumber, and brinjal.

Activity 3

Soil Alive

Objective	:	To help students realize that soil contains numerous living things—some of which so tiny that they are not visible to the naked eye.
Teaching Method	:	Experiment
Teaching Aids	:	Sheets of newspaper, a ruler, a small spade, a magnifying glass, soil life observation sheet
Group size	:	Groups of 5-6 students
Duration	:	60 minutes

Introduction

A soil that is high in organic matter is very much alive. A variety of organisms inhabit the soil. A handful of soil may contain billions of living organisms that are so tiny that they cannot be seen with the naked eye. Yet these microscopic organisms as well as larger soil creatures perform tasks that are vital to all life forms on earth. They decompose organic matter and fix atmospheric nitrogen among other benefits.

How to Do?

Select three different sites. Some suggested sites are: lawn of the school, public parks; near pond; a badly eroded field; a good agricultural field. Take necessary permissions to carry out the survey at the different sites.

At each site ask groups of students to do the following:

- Measure and mark off an area of land approx. 30 cm x 30 cm.
- Gently sort through the leaf litter, and collect any creatures they find there. Record their findings in the chart given.
- Dig the soil to a depth of 4-6 cm. observe and record the presence of roots. Are there any?
- Take out the soil and spread the soil onto a sheet of newspaper.
- Carefully sort the soil, watch closely for small living things with a magnifying glass. They watch for worms and other animals. They should also find other signs of animal life such as

One square metre of fertile soil contains more than 1000 million animals– from microscopic one-celled creatures to insects, worms, and burrowing animals like rats, mice and shrews.

burrows or eggs of insects which may be single or in masses or pods. Ask them to count the different kinds of animal life belonging to each of the groups listed on the following chart. After examining and counting, return the living things to the soil.

Recap and Discussion

Ask the groups to put up or present their Soil Life Observation Sheets. Let them compare the different notings and discuss why there are differences and similarities.

Ask the students whether all the soil samples look the same. If no, what was the difference between various samples? Did they find any evidence of plant life in the soil samples? Which soil sample had a lot of animal life?

Does the amount of animal life and the burrows the animals make, have any relation to the condition of the soil?

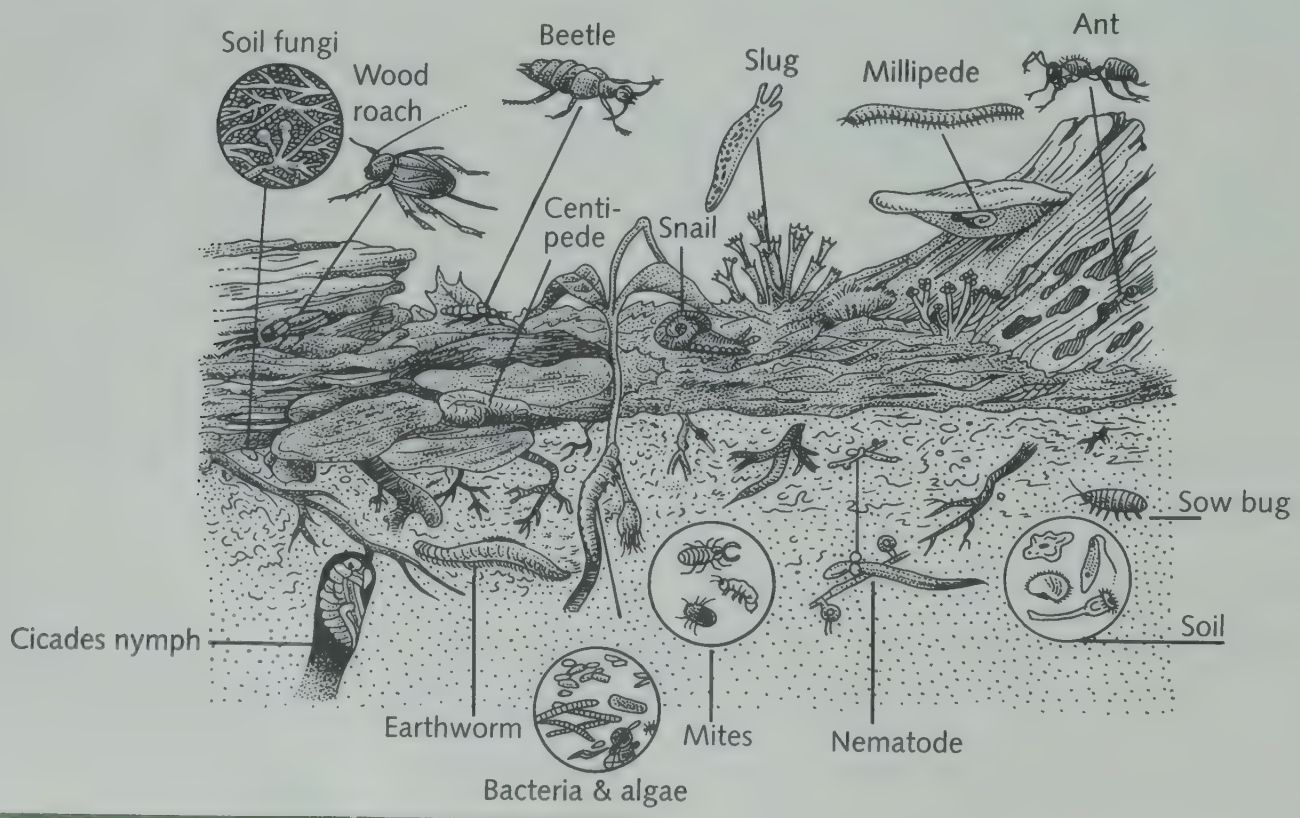
Discuss how a variety of organisms inhabit the soil. Soil harbours bacteria, fungi, algae, protozoa, nematodes, worms, and insects. Specific groups of organisms are responsible for specific activities in the soil.

Evaluation

What will be the effect of using excessive pesticides on the organisms in the soil?

Home Assignment

Why earthworms are called friends of the farmer? Speak to a farmer, a gardener, or some one who grows plants to know why are they are known so.



The biggest earthworm in the world Microchaetus microchaetus may reach 7 metres in length with a diameter of 2-3cm. This is found in South Africa.

Soil Life Observation Sheet

Section 1: Plants

Site: _____

1. In the soil, there are

   No roots few roots many roots

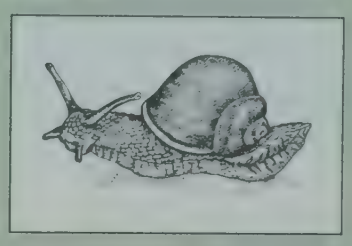
2. Other signs of plants include: _____

Section 2: Animals

1. I observed _____ different kinds of worms. (e.g. earthworms, which have no legs)

2. I observed _____ different kinds of larvae of insects. (e.g. thick worm-like creatures)

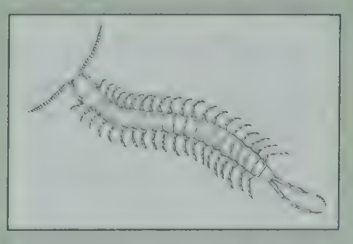
3. I observed _____different kinds of snails. (e.g. soft bodies animals; snails have shells, slugs do not)



4. I observed _____different kinds of insects. (e.g. animals with 3 pairs of jointed legs)

5. I observed _____different kinds of spiders, mites, ticks. (e.g. animals with 4 pairs of legs)

6. I observed _____different kinds of animals with more than 4 pairs of legs. (e.g. centipedes, millipedes)



7. Other creatures I found are: (any animal not included in one of the above groups)

Activity 4

Web of Life

Objective:	To understand that all living and non living components on planet earth are interlinked and interconnected.
Teaching Method:	Game
Teaching Aids:	Web of Life cards, a ball of string (about 250 metres long), paper pins. The teacher may prepare the cards including biotic and abiotic components of the environment as given in the list.
Group Size:	Up to 36 players
Duration:	30-45 minutes

Introduction

The world is made up of living and non living things. The living things consist of a variety of plants, animals and microorganisms. Sunlight, water, soil, etc., make up the non-living. The living and non-living components affect each other in complex exchanges of energy, nutrients and wastes. So, in effect there is a dynamic interaction between the living and the non-living components.

An understanding of the concept of interconnectedness helps us to understand the importance of conservation of nature and natural resources.

How to Do?

Ask the players to sit in a circle.

Distribute one card each to all the players. Make sure to include and distribute cards depicting the four main elements of nature: Sun, Soil, Air and Water. Also distribute a paper clip each.

Ask the players to pin their cards on their dresses so that every one in the group is able to see who they are. The players can take turns to tell the group who he/she represents.

After this, ask the players from whom the game should start.

Biodiversity forms the web of life of which we are an integral part, and upon which we so fully depend.

There may be a variety of suggestions from the players. Prompt the players by asking them whose energy makes life possible on earth. It is appropriate to begin with the Sun because it is the primary source of all energy that makes life possible on earth.

Take the ball of string and give it to the 'Sun'. Ask the 'Sun' to wind one end of the string on his/her finger.

The task for the Sun is to throw the ball to any component of nature with whom he/she has a relation. For example, the Sun gives energy to plants. So the Sun can throw the ball to the player having a 'Tree' card. But before throwing the ball, the Sun has to explain the relation it has with the Tree.

The 'Tree' then winds the string firmly once or twice around his/her finger and then passes it to another component he/she feels related to, e.g., Fruit.

'Fruit' can throw the string to 'Monkey', and the line of relationships continues as the string unwinds and begins to form a pattern which the players hold together. The game continues till the ball of string is completely used up.

Ask the players to raise their hands and see the web they have made. They have to hold the web tight to prevent it from sagging.

Recap and Discussion

Tell the players that the web they have made is the 'Web of Life'. It represents the relationships amongst different components in an ecosystem.

A healthy ecosystem, in which all the elements are in a viable state, bounces back to health even if an external pressure is applied.

For example, an ecosystem may be subject to 'Drought'. Press the Web down with your hand to illustrate this pressure. What happens then? Because the Web is held firmly, it bounces back after you release the pressure. Ask the players to note this.

Now, ask the players what would happen if some elements of the ecosystem are destroyed, for example, if all the trees are cut down. To illustrate this, ask the player with the 'Tree' card to let go of the string. All the players linked to the 'Tree' card will naturally experience a loosening in their strings. Ask the players who are immediately related to the tree card, e.g. fruit, leaf, roots, monkey, parrot, etc. to let go of their strings too. Now, there will be a.noticeable sag in the Web.

What happens when external pressure is exerted on the ecosystem now? Press down the Web and see. The Web will not bounce back with as much vigour as before.

Conclude the game by explaining to the players the interrelationships in an ecosystem and their importance.

The only way to save a rhinoceros is to save the environment in which it lives, because there's a mutual dependency between it and millions of other species of both animals and plants. — *David Attenborough*

Evaluation

Ask students to comment on the statement, Save the tiger, save the forest! Discuss the different links between the tiger and the forest? You may also discuss how these two are linked: Use of diclofenac and disappearance of vultures.

Home Assignment

Ask students to pick 5 animals and plants they see around them which do not provide any direct benefit to humans. In fact they may be classified as pests and weeds. Ask them to guess what could be the environmental benefits these could provide. For example, a lizard keeps in check all the mosquitoes. A weed holds the soil. A weed provides food to insects and other animals.

Web of Life Cards: List of Names

Sun	Air	Water	Buffalo
Soil	Tree	Parrot	Grasshopper
Algae	Fish	Eagle	Moss
Turtle	Insect	Frog	Fungus
Mosquito	Lizard	Butterfly	Spider
Rat	Butterfly	Ant	Kingfisher
Student	Grass	Dead Leaf	Squirrel
Earthworm	Shrub	Mongoose	Dead wood
Dragonfly	Monkey	Snake	Cloud

It's the little things citizens do. That's what will make the difference. My little thing is planting trees. *Wangari Maathai*

Climate Change

While Climate Change is a widely discussed issue, it is not directly dealt with in most the text books. However, both science and geography textbooks have a number of lessons/concepts that can help understand the science and impact of climate change.

These relate to climate and weather, atmosphere, composition of gases, distribution of water, physical changes, extreme weather events, photosynthesis, and digestion in ruminants (cows and buffaloes), forests, fossil fuels, and solar system.

It is important that these concepts provide a good peg to link and explain climate change.

This section includes a background information section which explains the main concepts that are part of the theme of climate change. This can serve as a good introduction to the theme and also provide supplementary information which can be used to guide the activities and generate discussion on the theme.

Given here is a listing of concepts covered in the textbooks with suggested activities which would help to achieve the instructional objectives.

Standard	Subjects	Concepts	Activity	Instructional Objectives
Class VI	Science	Air around us	Climate words	Understand that air contains gases which are also known as greenhouse gases as they keep the earth warm. Identify and name greenhouse gases in the air Air has gases which are released as pollutants due to human activity.

Overwhelming scientific consensus indicates that human activities are the primary reason for recent climate change.

		Water: Rains, Floods and Drought What happens if it rains for long periods? What happens if does not rain for long periods? Getting to know plants—photosynthesis	Climate words Carbon busters and carbon boosters	Extreme weather events harm humans, affect crop production, destroy forests and affect domestic and wild animals. Understand that plants breathe in carbon dioxide and give out oxygen. Understand why it is important to plant trees or not cut down trees.
Class VII	Science	Photosynthesis Digestion in grass eating animals ruminants	Carbon busters and Carbon boosters	Understand that plants breathe in carbon dioxide and give out oxygen. Understand that planting trees helps absorb carbon dioxide from the atmosphere. Understand that ruminants emit methane which is a greenhouse gas.
		Heat	Hot, Hotter	Understand that heat gets trapped in a car making the car warmer than it is outside. Understand that earth's atmosphere acts like the car windows in retaining heat on the earth's surface.

		Physical changes	Melting Ice	Understand that melting ice has different effects: when ice on land melts, it increases the water level of the oceans; when ice on seas melts, it does not increase the sea level.
		Weather and Climate	Climate words	Understand the distinction between weather and climate and that climate also changes over longer time scales.
		Winds storms and cyclones	Climate words	Climate change is also responsible for extreme weather events.
		Forests	Carbon busters, carbon boosters	Understand that forest are seen as carbon busters as they absorb and retain a lot of CO_2
		Atmosphere	Climate words	
	Geography	Our Changing Earth Air (CC)	Climate words	Understand that human activities are largely responsible for the current climate change phenomenon.
Class VIII	Science	Coal and Petroleum	Electricity Runs my Day	Understand that fossil fuels are the biggest contributors to increase CO_2 levels in the atmosphere.
		Solar System	How big is your Footprint	Understand that greenhouse effect is a natural phenomenon due to which the earth's surface is neither too hot nor too cold.

Understanding Climate Change

Introduction

Climate Change is an important topic. While it may not directly be a syllabus topic, it is important that students are aware of it and understand how it concerns and affects our lives.

This section combines information and class activities to communicate the science as well as issues related to climate change which could be taken up in both science and social studies.

The activities can inspire students and teachers to make necessary changes in lifestyle at the individual level which are a reflection of a Paryavaran Mitra.

What is climate?

We often confuse weather and climate. Weather is what is reported on the TV every night minimum and maximum temperature of different places, cloud cover, wind conditions, rainfall, humidity etc. Weather describes the atmospheric conditions in a given place at a given time.

The word climate describes the weather of a place in totality occurring over a period of years. The earth's climate is a result of complex interaction between solar, oceanic, terrestrial, atmospheric, and living components that make up planet Earth's systems.

Climatologists generally consider 30 years as the time needed to find out the climate of a place. It includes average weather conditions. Climate tells us what it is usually like in a place. For example, Ahmedabad and Delhi have generally dry climate, but Mumbai and Visakhapatnam have humid climate; the climate in Bangalore and Pune is said to be moderate in temperature, while Kochi has largely rainy climate.

What is changing?

Weather can change in a short time... it may rain for an hour and then the sun may come out. Climate changes too. Climate Change is natural and the earth's climate has been changing. For millions of years, earth has experienced cycles of warming and cooling. The cycles lasted approximately 100,000 years each. The Ice Ages of the past are examples of such climate change. In the past such changes took a very long time to occur. Today the rate of change is faster due to human activities because of which the earth is getting warmer.

Scientists who study the climate are still arguing about how fast the earth is warming and how much it will warm, but they do agree that the earth is warming. They have confirmed that the world is now warmer that it has been at any time in the past 2000 years. Global mean temperature rose by about 0.60°C during the 20th century.

There is a saying "Climate is what you expect, weather is what you get'.

Can humans change the climate?

Once all Climate Change occurred naturally. About 220 years ago came the Industrial Revolution, factories came up and things began to be made in bulk, using machines. Machines need energy to run. Most of this energy comes from fuels like coal and oil which are known as fossil fuels. When fossil fuels are burnt, carbon dioxide is released as a by-product. With industrialization, emission of gases like carbon dioxide, methane, ozone, chlorofluorocarbons, nitrous oxide, increased. The gases listed are called Greenhouse Gases (GHGs). Over the last 200 years our activities are dumping huge quantities of GHGs into the atmosphere. It is clear, this time around it is humans that are responsible for Climate Change.

GHGs and Climate Change: What is the link?

Earth is the only planet that supports life as we know it. Conducive temperature on earth's surface is one of the enabling factors for this. Earth's average surface temperature is 14.4°C. The average temperature on the surface of Venus is 449°C and that on Mars is -55°C. They are our closest planetary neighbours.

The earth is suitably warm for life to exist because of GHGs present in the atmosphere. These absorb some of the heat from sunlight and trap it near the earth's surface. This natural mechanism is known as Greenhouse Effect. Without GHGs the earth would have been sizzling hot by the day and freezing cold during the night.

But too much of GHGs can create problems. As their quantity increases more heat is retained on the earth's surface. This causes Global Warming. This warming of the earth is leading to a change in climate, with effects on the environment.

For instance, scientists predict that if we continue releasing carbon dioxide at the rate we are now, the CO_2 levels will double to what it was before the Industrial Revolution. This could raise the earth's average temperature by about 5° - 8°C by 2050. This rise may not sound like a lot, but the consequences will be enormous!

Carbon dioxide and Climate Change

Carbon dioxide is both a pollutant and a natural part of the atmosphere. Presently, it accounts for about 380 molecules for every million molecules in the air (380 ppm). The emissions are increasing by about 1% per year. The amount of CO_2 before Industrial Revolution was 270-280 ppm.

CO_2 produced by human activities is responsible for more than 55 per cent of current global warming.

How warm is warm?

We have all experienced a few "really hot" days every summer. That does happen. It is like having a fever for 2-3 days. But if the fever does not come down and persists over many days or weeks it is a matter of concern. Similarly, if temperature on the earth continues to rise by even a small degree over a long period of time, then the effects will be felt.

A natural system known as the "greenhouse effect" regulates temperature on Earth. Just as glass in a greenhouse keeps heat in, our atmosphere traps the sun's heat near earth's surface.

What will be the effect of a warmer world?

Small variations in temperature could have big impacts. Climate Change will change more than the climate of the earth. Every aspect of life on earth will be affected, directly or indirectly.

Weather extremes

There will be more cyclones, storms and floods. Most places will become hotter; some will become drier and others wetter. We will experience more violent weather events, heat waves, drought, floods (because of heavier rainfall and melting glaciers) and intense storms.

Shrinking glaciers and melting sea ice

Glaciers and ice caps are sensitive indicators of Climate Change. Mountain glaciers are already shrinking. The Arctic sea ice is becoming very thin, especially in late summers. In August 2000, there was no ice at all at the North Pole.

Rise in sea level

Melting of glaciers and polar ice caps will increase water in the seas. This, along with expansion of sea water due to warming, would rise the sea level, and it would submerge small islands and coastal areas. For example, Maldives and Tuvalu are two island nations that would be affected by sea level rise.

Delta regions of rivers are also high risk areas. Many of these regions are already prone to flooding. Thousands of people dependent on these fertile agricultural areas would suffer. A one-metre sea level rise would flood several coastal cities, and the thickly populated deltas in Egypt, Bangladesh, India and China, where much of the world's rice is grown.

Loss of ecosystems and biodiversity

Plants and animals would be forced to migrate to keep up with climate shifts. Those that cannot migrate would disappear in the course of time. Those adapted to cooler climates will get extinct as their habitats disappear. Shifts in regional climate would threaten many national parks, wildlife reserves and coral reefs and affect the rich diversity of life they have.

Scientists have projected that climate change is the single biggest threat to the 22,000 polar bears that remain in the world. Polar bears need sea ice to launch hunting expeditions for ringed seals, their primary prey. The Arctic sea ice is melting earlier in spring and this means bears cannot hunt for longer periods to develop enough fat reserves to keep them going in winters. By the end of the summer they are weak and are unable to bring up their young ones.

Agricultural production

Areas of the globe that are now producing rice, wheat and other food grains may not be able to produce the same quantity anymore because of global warming. This will eventually affect availability of food.

Increased evaporation and drier soils in some regions would result in prolonged droughts. In the drier areas need for irrigation would increase. Agriculture in warmer areas would also suffer from increased infestation of pests, crop diseases and weeds.

World temperature measurements began in 1860. The global average temperature is calculated based on millions of individual measurements taken from around the world.

The flooding of coastal areas as a result of sea-level rise would lead to a loss of agricultural land. It would also lead to intrusion of salt water into coastal aquifers which would in turn affect agricultural production.

Effect on human health

Deaths due to heat waves and other extremes of climatic conditions are some direct consequences that we would face. Tropical vector– borne diseases such as malaria, encephalitis, yellow fever and dengue fever could spread to the present temperate regions of the world.

It is also clear that the effects of Climate Change cannot be simply reversed or 'switched off'. The effects of global warming are projected to continue for the next hundreds of years. The GHGs already released into the atmosphere will not just disappear. They will linger– methane for decades, carbon dioxide for a couple of hundred years, and gases like perfluorocarbons, for even thousands of years.

Even if all emissions of GHGs ceased today, the climate would continue to change, and with it the effects of life on our planet!

What should be done?

Burning fossil fuels is causing global warming and leading to Climate Change. These fuels are burned for energy. Modern lifestyles are very dependent on energy.

As everyone uses energy, all of us can help reduce global warming by just using less energy. That's easier said than done!

There is a global call to cut carbon emissions. By being aware of, and reducing excess use of fossil fuels, we can help reduce carbon dioxide emissions by at least a small amount.

How will Climate Change impact India?

Climate Change is predicted to impact India's natural resource base, including water resources, forestry and agriculture. Changes in precipitation, temperatures, monsoon timings, and extreme events are likely to have great implications on livelihoods, health, and biodiversity of the country. Some of the impacts are given here.

Climate Change and sea level

India has the world's seventh largest coastline measuring over 7,500 km. The coastline is unique not only in its diversity of habitat and ecology but also in its history and geography. One quarter of the Indian population lives along the country's coasts, and is largely dependent on coastal livelihoods. According to SAARC Coastal Management Centre estimate of 2000, 26.3 per cent of India's population lives within 100 km of the coast.

Climate Change is predicted to result in increases in mean sea level, as well as possible increases in the frequency and intensity of coastal surges and cyclones that already cause significant damage to coastal populations. These predicted changes threaten life, livelihoods and infrastructure.

Rising sea levels increase the risk of coastal flooding, and could cause population displacement. More than half of the world's population now lives within 60 kilometres of shorelines.

Climate Change and water

While India has about 16 per cent of the global population, it only has 4 per cent of total fresh–water resources, and many parts of India already face water scarcity. Water is very important not only for basic human needs, but also for agriculture and other sectors. It is also important for economic development. Water is a core component of climate and which is greatly affected by Climate Change. It can have important implications for fresh water supply for drinking water, rain-fed agriculture, groundwater supply, forestry, biodiversity, and sea level.

Climate Change and Himalayan glaciers

Glaciers in the Himalayas feed the country's big rivers in the northern region. The health of the glaciers has impacts on agriculture and livelihoods of the region. The retreat parameters of 35 glaciers show that 43 per cent of the glaciers in the Himalayan region are retreating in the range of 10 to 20m/yr. The causative factors for this variable retreat may be subnormal snowfall, higher temperature during summer, less severe winter or a combination of all of them.

Climate Change and agriculture

The agricultural sector represents 35 per cent of India's Gross National Product (GNP) and as such plays a crucial role in the country's development. Agriculture represents a core part of the Indian economy and provides food and livelihood activities to much of the Indian population. While the magnitude of impact varies greatly by region, Climate Change is expected to impact on agricultural productivity and shifting crop patterns. The implications are wide-reaching, and could affect food security, trade policy, livelihood activities and water conservation issues, impacting large portions of the population.

Climate Change and forests

India's forests, which cover nearly 20 per cent of the country's geographic area, are important for biodiversity, biomass supply, watersheds and livelihoods of forest dependent communities. Climate Change is predicted to alter existing biome types, cause forest dieback, and loss of biodiversity. In India nearly 2,00,000 villages are located in or near forests, and depend heavily on forest resources for their livelihood activities.

Energy demand

Existing economic growth scenarios project total power generation capacity in India to increase nine times from 96 GW (one gigawatt(GW) = 1 000 000 kilowatts (KW)) to 912 GW between 1995-2100. As a result of Climate Change, it is estimated that approximately 1.5 per cent more power generation capacity will be required. Increased energy demand may arise from a number of sources. For example, increases in average temperature can result in the need for space cooling for buildings, and variability in precipitation can impact irrigation needs and consequent demand for energy from groundwater pumping.

Intense short-term fluctuations in temperature can also seriously affect health – causing heat stress (hyperthermia) or extreme cold (hypothermia) – and lead to increased death rates from heart and respiratory diseases.

World Health Organisation.

Climate Change and human health

Predicted impacts on human health due to Climate Change include increases in temperature related illnesses, vector borne diseases, health impacts related to extreme weather events, and health effects due to food insecurity.

Among vector-borne diseases in India, malaria is of considerable concern. Periodic epidemics of malaria occur every five to seven years, and the World Bank estimates that about 5,77,000 DALYs (disability-adjusted life years) were lost due to malaria in India in 1998. Climate Change could increase the incidence of malaria in areas that are already malaria-prone, and also introduce malaria into new areas.

Source: Study Report: Investigating the impacts of Climate Change in India, the UK's Department for Environment, Food and Rural Affairs (DEFRA) and India's Ministry of the Environment and Forests.

National Action Plan on Climate Change

In 2008, India's first National Action Plan on Climate Change outlining existing and future policies and programs addressing climate mitigation and adaptation was released. The plan identifies eight core "national missions" running through 2017.

National Mission for Enhanced Energy Efficiency

National Mission on Sustainable Habitat

National Water Mission

National Mission for Sustaining the Himalayan Ecosystem

National Mission for a "Green India"

National Mission for Sustainable Agriculture

National Mission on Strategic Knowledge for Climate Change

National Mission on Solar Energy

The Action Plan emphasizes the overriding priority of maintaining high economic growth rates to raise living standards, the plan "identifies measures that promote our development objectives while also yielding co-benefits for addressing climate change effectively."

(Source: http://www.indiaenvironmentportal.org.in/node/252812)

It is now well recognized that human-activity induced warming of our atmosphere is predicted to have adverse impacts on the Earth's ecosystems and human socio-economic systems. In 1992 at the Rio Summit world leaders established a forum under the UN to deal with Climate Change: the UN Framework Convention on Climate Change (UNFCCC). In this forum, countries try to negotiate emission reduction targets to mitigate Climate Change. In addition, adaptation, climate finance, technology transfer and capacity building are negotiated. Solutions need to be found in all these areas to meet the objective of avoiding 'runaway Climate Change' which would be not be able to be managed any more. Many sectors such as energy, transport, and waste and others are required to tackle Climate Change. Climate Change is thus a cross-cutting issue and should be understood in its many facets by everyone.

The glacier from which Edmund Hillary and Tenzing Norgay began their ascent of Mt. Everest in 1953 has retreated by by about 4.8 km over the past 50 years.

Activity 1

Climate Words

Objective	:	Introduce the many dimensions of Climate Change through reading and discussion.
Teaching Method	:	Essay reading and Comprehension
Teaching Aids	:	Copies of the essay, blackboard
Group Size	:	Groups of 4-5
Duration	:	60 minutes

Introduction

Climate Change—these words are appearing often in newspapers and television. Students may not be aware of what it means. It is important for everyone to become aware of the many dimensions of Climate Change, and how this affects our lives—directly or indirectly.

How to Do?

Divide the students into groups of 4-5. Give copies of the essay given on the next page.

Tell them that this essay is about Climate Change (CC). They should read the essay and list down all the words which they think relate to Climate Change.

Ask them to give a title to the essay.

Give them 15 minutes for the task. Let each group present their words. Note down the words on the blackboard.

Recap and Discussion

You could use the information provided in the earlier pages to orient the students to the different aspects of Climate Change. Some points for discussion are:

- What is climate/weather?
- What is climate change?
- What is greenhouse effect/greenhouse gas?
- What are the signs of global warming?
- What are the reasons for CC?
- What are the consequences and impacts of CC?
- What can be done to reduce the impacts of CC?

A WHO report estimated that over 150,000 people are dying every year in developing countries from the effects of global warming, ranging from malaria to malnutrition, to extremes of heat, cold, and floods.

Evaluation

Using the listed words, ask students to make a word chain/map that illustrates causes and effects of climate change. Use the word map to discuss the different aspects of global warming and Climate Change.

Home Assignment

Ask students to look through newspapers and magazines and cut out any pictures, words or stories that could be linked to any aspect of Climate Change. Let them all bring the clippings to class. Then divide students into small groups and ask each group to make a creative collage using the clippings.

Essay

Introduction

The Earth is wrapped in a blanket of air called the 'atmosphere', which is made up of several layers of gases. The sun is much hotter than the Earth and it gives off rays of heat (radiation) that travel through the atmosphere and reach the Earth. The rays of the sun warm the Earth, and heat from the Earth then travels back into the atmosphere. The gases in the atmosphere stop some of the heat from escaping into space. These gases are called greenhouse gases and the natural process between the sun, the atmosphere and the Earth is called the 'Greenhouse Effect', because it works the same way as a greenhouse. The windows of a greenhouse play the same role as the gases in the atmosphere, keeping some of the heat inside the greenhouse.

Just Hot Enough

The atmosphere has a number of gases, often in tiny amounts, which trap the heat given out by the Earth. These are called Greenhouse Gases (GHGs)

The main GHGs are:

Water vapour: occurs naturally in the atmosphere.

Carbon dioxide: is produced naturally when people and animals breathe. Plants and trees absorb carbon dioxide to live. Volcanoes also produce this gas. Carbon dioxide is not the same as carbon monoxide.

Methane: comes from cattle as they digest their food. The gas also comes from fields where rice is grown in paddy fields.

Nitrous oxide: when plants die and rot, nitrous oxide is produced.

Ozone: occurs naturally in the atmosphere.

Climate change refers to long term changes in climate, including average temperature and precipitation.

To make sure that the Earth's temperature remains constant, the balance of these gases in the atmosphere must not be upset.

Getting Hotter!

Some of the activities of humans also produce greenhouse gases. These gases keep increasing in the atmosphere. The balance of the greenhouse gases changes and this has effects on the whole of the planet.

Burning fossil fuels - coal, oil and natural gas—releases carbon dioxide into the atmosphere. Cutting down and burning trees also produces a lot of carbon dioxide.

Because of such human activities, there are more and more greenhouse gases in the atmosphere, more heat is trapped which makes the Earth warmer. This is known as Global Warming. This warming of the earth is leading to a change in climate.

Climate Change will change more that the climate of the earth. Every aspect of life on earth will be affected, directly or indirectly.

The Effects

With more heat trapped on Earth, the planet will become warmer. For example, summers will get hotter, and winters too. The conditions we are living in are perfect for life, and a large rise in temperature could be terrible for us and for any other living thing on Earth.

Weather

In different parts of the world, the effects will be different, some places will become drier and others will be wetter. Although most areas will be warmer, some areas will become cooler. Changes in the weather will bring more rain in some countries, but others will have less rain. There may be many storms, floods and drought. Plants, animals and even people may find it difficult to survive in such conditions.

Sea Level

Higher temperatures will make the water of the seas and oceans expand. Ice melting in the Antarctic and Greenland will flow into the sea.

All over the world, sea levels may rise, perhaps by as much as 20 to 40 cm, by the beginning of the next century.

Higher sea levels will threaten the low-lying coastal areas of the world, and the small islands. Throughout the world, millions of people and areas of land will be at danger from flooding. Many people will have to leave their homes and large areas of farmland will be ruined because of floods.

Agriculture

The changes in the weather will affect the types of crops grown in different parts of the world. Some crops, such as wheat and rice grow better in higher temperatures, but other plants, such as maize and sugarcane do not. Changes in the amount of rainfall will also affect how many plants grow.

The effect of a change in the weather on plant growth may lead to some countries not having enough food. Increased evaporation and drier soils would lead to drought. There may also be increase in pests, crop diseases and weeds.

Plants & Animals

It has taken million of years for life to become used to the conditions on Earth. As weather and temperature changes, the homes of plants and animals will be affected all over the world. One example is that of polar bears and seals in the Arctic region that will have to find new land for hunting and living, if the ice in the Arctic melts.

Many animals and plants may not be able to cope with these changes and could die. This could cause the loss of some animal and plant species in certain areas of the world or everywhere on Earth. In other words, biodiversity will be threatened.

People

The changes in climate will affect everyone, but some populations will be at greater risk. For example, countries whose coastal regions have a large population may see whole populations move inland to avoid flood risk areas. Tropical diseases such as malaria, dengue, yellow-fever could spread to areas where at present they are not occurring. The effect on people will depend on how well we can adapt to the changes and how much we can do to reduce climate change in the world.

The effects of climate change cannot be "switched off". The Greenhouse Gases already released in the atmosphere will linger on for many many more years. Even fall the emission of GHGs stopped tomorrow, the climate will continue to change and this climate change will affect life on our planet!

Most greenhouse gases are extremely effective at absorbing heat escaping from the earth and keeping it trapped. In other words, it takes only small amounts of these gases to significantly change the properties of the atmosphere.

Activity 2

Hot, Hotter!

Objective	:	Understand the phenomenon of Greenhouse effect through a demonstration.
Teaching Method	:	Experiment
Teaching Aids	:	Bell jar, thermometer, paper cup.
Group Size	:	Entire Class
Duration	:	35 minutes

Introduction

The greenhouse effect is a natural phenomenon whereby heat-trapping gases in the atmosphere, primarily water vapour, keep the Earth's surface warm. Human activities, primarily burning fossil fuels and changing land cover patterns, are increasing the concentrations of some of these gases, amplifying the natural greenhouse effect.

How to Do?

Ask students to place a paper cup, inverted, in a sunny spot in the open. Place a thermometer on it. Let them note the temperature recorded by the thermometer after 20 minutes.

Now let them place a bell jar over the cup. They have to note the temperature recorded by the thermometer in the bell jar after 20 minutes. The temperature recorded in the bell jar would be higher.

The difference in temperature is due to the heat which got trapped in the bell jar. The glass retained the heat within the jar. This is what happens in a greenhouse.

Recap and Discussion

The Greenhouse Effect is a natural phenomenon whereby heat trapping gases in the atmosphere, primarily water vapour, keep the Earth's surface warm. But now human activities, primarily burning fossil fuels are increasing the concentrations of these gases well beyond the natural levels, thereby amplifying the natural greenhouse effect.

In the discussion, let students understand that while Greenhouse Effect is natural, the current climate change due to enhanced greenhouse gases can be attributed to humans.

The greenhouse effect isn't a bad thing. It's essential for life on Earth – when it's not too vigorous. If not for the greenhouse effect, the temperature on the surface of Earth would be swinging wildly from 107°C during the day to -153°C at night.

Evaluation

A greenhouse is a building covered with materials such as glass or plastic roof. Greenhouses are often used for growing flowers, vegetables, fruits, and tobacco plants. These allow these crops to be grown throughout the year. This is possible because, greenhouses protect crops from too much heat or cold, shield plants from cyclones and heavy rain, and help to keep out pests.

Ask students to explain how greenhouses allow crops to be grown throughout the year.

Home Assignment

Students can experience greenhouse by themselves. Ask students to get in to a car or a bus which is parked in the hot sun.

Why is it much hotter inside than outside?

Activity 3

Melting Ice

Objective	:	To understand the phenomenon of ice melt and its impact on water level increase
Teaching Method	:	Experiment
Teaching Aids	:	Ice cubes, glass, water, ink or fabric blue
Group Size	:	Entire class
Duration	:	30 minutes

Introduction

There is a lot of water on earth. It is in oceans, ice caps, rivers and lakes and in the ground. Water exists in three physical forms. It plays an important role in weather and climate.

About 2 per cent of the water on earth is locked in glaciers and ice-caps. Climate change (global warming) has an impact on the ice. If the ice on Greenland were to melt, the sea level would rise

by 7m! But the melting of Arctic ice would not contribute to sea level rise. And again, at the South Pole, melting ice on the continent of Antarctica would lead to rise in sea level. Why is it so?

How to Do?

Ask students to take a glass tumbler. Place it on a flat dry surface. Put ice cubes into it, until one or two pieces stick above the brim. Fill the glass with coloured (add a drop of ink or fabric blue) water up to the brim such that it can hold no more water. Be careful not to spill the water.

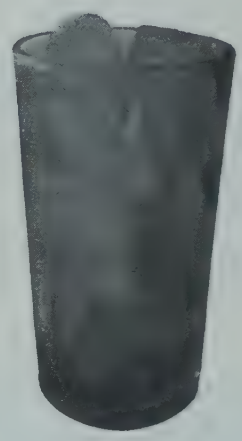
What do you think would happen after a while? Will the ice cubes melt and water overflow?

Observe until all the ice melts. There would be little condensed water outside but actually no overflow of coloured water from the glass!

The ice melts and fits into the glass. How can it fit in to an already full glass? Water shrinks when it melts and occupies less space in liquid state. On the other hand, water expands when it freezes and occupies more space.

Recap and Discussion

The effects of melting ice will not be the same everywhere. It depends on where the ice is.



The North Pole (Arctic) is ice floating on water. So the ice that melts here would not contribute to rise in sea level (like the ice cubes in the glass). The South Pole is on the continent of Antarctica. If the ice here melts, it will contribute to sea level rise. There is another large mass of ice close to the North Pole, which is the island of Greenland. The ice here extends up to 1.3 square million km and stands at an average height of 2 km!

Evaluation

Students should locate Arctic, Antarctic, Greenland, North Pole and South Pole on a world map.

Home Assignment

Ask students to imagine that all ice-caps and glaciers on the earth are melting. Let them write how it is going to affect people living in the coasts.

The more obvious signs of Climate Change are the rapid retreat of glaciers in Greenland, Alaska, the Himalaya, Antarctic; the thinning and disappearance of sea ice in the Arctic Ocean during summer; the melting of permafrost in Canada, Alaska and Siberia; and the rise of sea level and an increase in extreme weather.

Activity 4

Electricity Runs My Day

Objective	:	To understand that CO_2 is generated while using fossil fuels to generate electricity
Teaching Method	:	Listing and discussion
Teaching Aids	:	Writing material
Group Size	:	Individual
Duration	:	30 minutes

Introduction

Electricity appears like a clean energy source. There is no smoke and soot to be seen. However, There are scientific studies on climate that indicate that most of the observed increase in global average temperatures is very likely due to human activities. This is due to increase in greenhouse gas concentrations resulting from the burning of fossil fuels. Fossil fuels are an important source for the production of electricity world over.

By conserving electricity we not only save energy and money but also put in less CO_2 into the atmosphere.

How to Do?

Ask students to think of all activities they are involved in throughout the 24 hours day and list all those that, directly or indirectly require electricity. They will be amazed at the long list that emerges. Remind them to include use of mobiles, microwave, AC, washing machine etc.

This will help to demonstrate that every one of us uses a great deal of energy even as we go about our day-to-day activities. In fact, that our modern lifestyles are today greatly dependent on energy, especially on electricity. There is a need to understand that fossil fuels are burnt to obtain this energy.

Recap and Discussion

What do we use electricity for? We use it for lighting, running fans and coolers, for running electrical appliances like refrigerators, washing machines, grinders, refrigerators and televisions. It is used on the roads for traffic signals. It is used in shops and hospitals.

The melting of ice in the Arctic region is threatening the survival of the polar bear as it is restricting their ability to hunt.

Ask students where do we get electricity from? How is the electricity produced? Is it produced by burning fossil fuels?

Evaluation

Ask students to make posters to explain how saving electricity actually is a good way to reduce CO_2 emissions into the air.

Home Assignment

- Ask students to write an essay on the topic 'A day without electricity'.
- Ask students to think of at least five activities that could be carried out without the use of electricity.

Activity 5

Carbon Busters or Boosters?

Objective	:	To classify activities as those that emit carbon dioxide and those that help to prevent/reduce CO_2 emissions.
Teaching Method	:	Game
Teaching Aids	:	Activities list and chits
Group Size	:	Individual
Duration	:	35 minutes

Introduction

CO_2 is one of the chief GHGs responsible for global warming. Coal, petroleum, diesel, airplane fuel, natural gas contributes in a big way to the release of CO_2. A large number of our activities use these fuels or products and thereby add to carbon emissions.

Electricity comes from power plants, most of which use coal and oil to make it. Burning coal and oil produces CO_2 which is a GHG.

How to Do?

Prepare chits using the list provided. Repeat activities as per the number of students.

On the black board, draw two columns. Give the titles Carbon Busters to one and Carbon Boosters to the other.

Distribute the chits. Ask students to think for a while. They have to come up one by one and write their activity in any one of the columns.

(✓) Carbon Busters: Activities that help reduce carbon emissions

(X) Carbon Boosters: Activities that add to carbon emissions

- Bicycling
- Using more disposable items
- Planting trees
- Taking public transport
- Composting your degradable waste
- Harvesting rain water
- Using regular incandescent light bulbs
- Eating local and in-season food
- Always carrying a cloth bag
- Buying new textbooks every year
- Cutting trees
- Using personal vehicles to get around
- Reducing the use of electricity when and where possible
- Using natural light during the day
- Walking when possible
- Using CFL bulbs for lighting
- Letting electric devices be 'on' or in 'standby' when not in use
- Burning waste
- Eating the vegetable from your own garden

Recap and Discussion

Discuss in detail how each one is either a carbon buster or a carbon booster.

Evaluation

Ask each student to write down 4 carbon busting activities that they can do in their daily life. They should be practical and doable.

Home Assignment

Observe and note some activities in your home that help reduce carbon emissions and some that add to carbon emissions. Discuss with your family how you all can adopt at least two activities that help to reduce carbon emissions.

Riding a bicycle, walking, carpooling, combining trips, telecommuting or buying a more efficient car remain some of the most direct ways almost anyone can cut their fossil fuel use and greenhouse emissions.

Activity 6

How Big is Your Footprint?

Objective	:	To calculate the ecological footprint
Teaching Method	:	Survey
Teaching Aids	:	Ecological footprint quiz and computer with internet connection
Group Size	:	Individual
Duration	:	35 minutes

Introduction

Climate Change (CC) is closely linked with another C. That is consumption. Consumption involves exhaustive use of materials and energy. CC is linked with our lifestyles: what we buy, how we use our resources, and how we live. How do we know how much materials and energy each of us utilizes to maintaining our lifestyle? Ecological footprint calculator is a tool that can help us find out.

How to Do?

Method 1

Distribute copies of the quiz to the students. Ask each student to complete based on their daily actions and habits. After all have filled in, ask students to exchange their sheet with that of their neighbour.

Now, ask students to mark the sheets and give a score as given below:

1 point for each" a" answer

2 points for each "b" answer

3 points for each "c" answer

Let them add up the scores and exchange the sheets back. Call out that those who have got a score from

0-10 should give themselves ★★★

11-20 should give themselves ★★

21-30 should give themselves ★

While action now to reduce emissions is critical, the existing build-up of GHG concentrations means that some climate change in the coming decades is inevitable and planning must start now on adapting our economy and society to these changes.

Explain the star rating to the students.

★★★

You have a small footprint! Your actions and habits help to reduce waste and conserve resources.

★★

You have a medium-sized footprint. Although some of your actions are environment friendly, a few changes will help the environment more.

★

Your footprint is big! Read the questions again and ask yourself if you can make changes to help decrease the size of your footprint. Even small changes can have a big effect!

The ecological footprint calculator is a tool that can help us know how much materials and energy each of us utilizes to maintain our lifestyle? In this activity students can calculate and find out their "footprint".

Method 2

Students to log on to any of these sites to calculate their ecological footprint.

http://www.earthday.net

http://www.ecologicalfootprint.com

http://www.footprintnetwork.org

http://www.myfootprint.org

Recap and Discussion

Ecological footprint is an estimate of earth's productive land area and water that it takes to supply the resources that an individual or group demands, and to absorb the waste that the individual or group produces.

Every human being has an ecological footprint! It is our lifestyle that determines how small or big our footprint is.

Discuss how every human being has an ecological footprint! We need natural resources for all our wants, needs, and conveniences. The more we consume, more energy, food and goods have to be produced. When we consume more and more, we are also using up more resources of earth.

Evaluation

It is the lifestyle that determines how small or big our footprint is. Ask students to identify 10 things that they did yesterday that increased their footprint (for example, going to the shop on a scooter even though it was with in walking distance).

Home Assignment

Get your neighbours and family members to take this quiz, and together think of way to achieve a 3 star rating.

It is the lifestyle that determines how big or small our footprint is.

Ecological Footprint Quiz

1. **How did I get to school today...**
   a. I walked or rode my bike b. I took the bus c. I was driven in a car
2. **How much water did I use this morning...**
   a. I did not shower b. I had a short shower c. I bathed in a full tub
3. **When I eat a meal there is this much food left on my plate...**
   a. I clean my plate b. A little bit of food
   c. Half of the food that was there to begin with
4. **In my lunch box, this much food is wrapped in disposable paper or plastic...**
   a. None of it b. Some of it c. All of it
5. **During one day, I waste this many sheets of papers from my notebook...**
   a. I reuse papers b. 5-10 sheets c. more than 10 sheets
6. **When I leave a room I turn off the lights and fans...**
   a. Always b. Sometimes c. Never
7. **At my house we recycle...**
   a. All of the things that can be b. Some of the things c. Nothing
8. **When I am at school, I drink water from...**
   a. School water fountain b. My own water bottle
   c. Bottled water which I have bought
9. **If I put all of the garbage that I threw away today into a container, I would need...**
   a. I produced no garbage today
   b. A shoebox c. A crate
10. **Each day, I eat this many packets of packaged snacks ...**
    a. 1 b. 2 c. 3 or more

Source: adapted from the activity in http://www.earthcarecanada.com

Ecological Footprint is expressed in global hectares (gha) or acres. The world average is 2.2 gha.

A Climate Champion is a Paryavaran Mitra

Your students have by now carried out a number of activities related to climate change. They have also understood the links between the different theme and Climate Change. Discuss with the students how these messages can become the starting point for a project to be carried out in the Club.

The Paryavaran Mitra can start a campaign in the school to encourage wise use of resources and to take the lead in positive actions (individually and collectively) to reduce the carbon footprint.

Save Electricity

Whenever we use electricity we put GHGs into the air. By turning off lights, TV, computer when not in use, you can help a lot. It saves energy and of course money. Use energy from renewable sources.

Bus, Bicycle, Walk

More cars on the road means more GHG emissions. Try to car pool. Take a bus or train whenever you can. Bicycle or walk wherever you can.

Drive the Change

Get parents to change their driving habits --- to drive gently, and within speed limits, to keep the vehicle regularly serviced and tuned. When planning to buy a new vehicle, survey the market for more fuel efficient and environment-friendly vehicles.

Conserve Resources

Conserve energy at home and school

Save water, save paper

Prevent waste Recycle, Reuse, Refuse what you do not need (plastic bags, extra packaging)

Do not burn waste

Compost biodegradable waste

Keep electrical appliances in good condition ensure that air filters on ACs are clean, fridge coils and tube lights are dust free. Depend less on artificial aids for cooling and heating and more on nature... sunlight and natural ventilation.

Buy Local

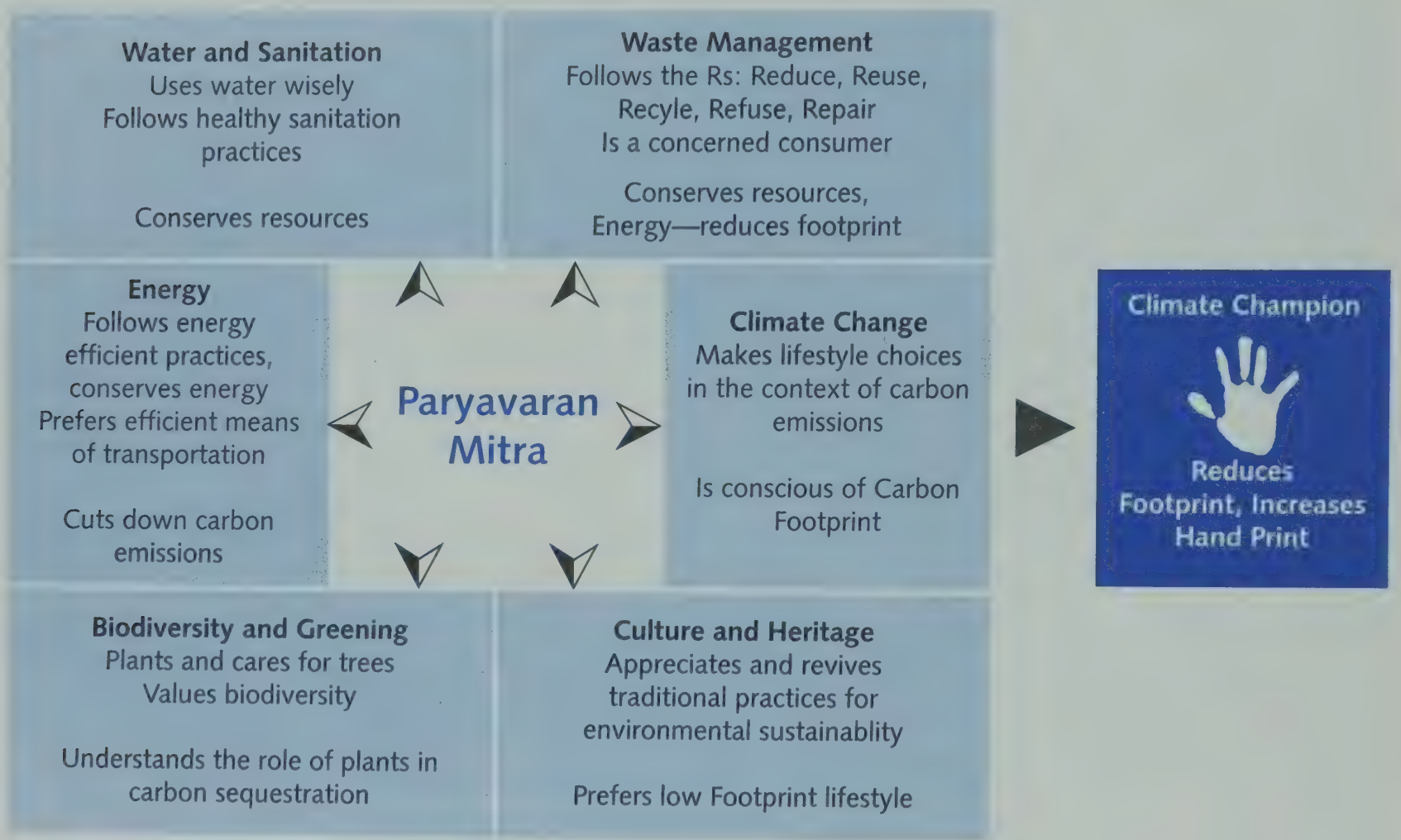
Buy your food fresh from local markets. Avoid packaged, preserved and imported goods. Trucks and planes bringing goods from far away from within or outside the country use huge amounts of fuel for transportation, and more energy goes into their storage.

Be a Concerned Customer

Choose products and services that use environment friendly technologies and energy efficient practices. Why not consider a solar water heater or cooker? No fossil fuels, no emissions, just pure sunlight!

Save a Tree, Plant a Tree, Maybe More

Trees are great for absorbing carbon dioxide, a greenhouse gas, from the air. Every tree you prevent from being cut, or that you plant, and nurture till it is grown, will serve a lifetime absorbing carbon dioxide, even while it provides beauty and shade, shelter and food, and keeps the soil firm and healthy.


Water and Sanitation
Uses water wisely
Follows healthy sanitation practices
Conserves resources
Waste Management
Follows the Rs: Reduce, Reuse, Recyle, Refuse, Repair
Is a concerned consumer
Conserves resources, Energy—reduces footprint
Energy
Follows energy efficient practices, conserves energy
Prefers efficient means of transportation
Cuts down carbon emissions
Paryavaran Mitra
Climate Change
Makes lifestyle choices in the context of carbon emissions
Is conscious of Carbon Footprint
Climate Champion
Reduces Footprint, Increases Hand Print
Biodiversity and Greening
Plants and cares for trees
Values biodiversity
Understands the role of plants in carbon sequestration
Culture and Heritage
Appreciates and revives traditional practices for environmental sustainablity
Prefers low Footprint lifestyle

A Paryavaran Mitra in true sense is a Climate Champion !

The time is always right to do what is right.

Martin Luther King Jr.

Culture and Heritage

This section does not follow the Unit Plan format. A list of activity ideas is provided which can be used whenever the opportunity arises. These are closely linked with the themes of water, energy, waste, and biodiversity.

The local environment consists of not only of the physical and natural world but also the socio-cultural world. Communities have rich cultural resources: local stories, songs, jokes, riddles and art, all of which can enrich language and knowledge in schools. (NCF 2005)

Languages, myths, stories, music, dance, ceremonies, traditional medicine, and traditional crafts like weaving, pottery, block printing, vessels, kite making, jewellery etc, the knowledge, skills, practices, and beliefs of these are handed down from generation to generation. They reflect the sprit of people, the community and their knowledge and wisdom. Many of these resources and practices are what is described as heritage or intangible cultural heritage.

Culture and heritage provide diverse leanring situations— whether formal, non-formal or informal. Interactions with nature, practitioners of traditional arts and crafts, built environments and observing and learning aid to get insights into about various practices, beliefs, life styles.

Interaction with the natural environment is of central importance in the way we express ourselves through folklore, art, religion. The link between nature and culture shows that to nurture, and to respect our local environments both natural and human-made, and local heritage ultimately leads to a deeper respect for other cultures as well.

Building, sacred sites, tanks, tombs, forts, palaces, and even entire cities, can help us to rediscover /to get a glimpse of the life and activity of our ancestors. This built heritage will help us to understand and cherish our cultural legacy.

All these are relevant opportunities to enhance awareness, and to develop skills and attitudes needed to question the way we think, the values we hold and the decisions we make in the context of wise use of nature and natural resources for a development that is sustainable.

As you will see, the activities are linked to the themes of the Paryavaran Mitra programme. They will help to understand the traditions of conservation, respect, wise use in the themes of water, energy, waste, biodiversity; and respect for the lifestyle that value resources and minimizes waste. Our traditional practices reflect our respect for diversity, both natural and cultural.

These activities will encourage students to explore and discover diverse facets of our rich culture and heritage, and will play an important role in the overall development of the student as an integral member of a community.

Culture is a collectively held set of values and assumptions. It manifests itself through oral traditions and expressions, performing arts, social practices, rituals and festive events, knowledge and practices concerning nature and traditional craftsmanship.

Such activities help to:

- Adds an exciting dimension to learning in the classroom.
- Encourage creative potential
- Deepen understanding of how and what we are
- Contribute to overall human development
- Make students want to care for the past so as to create a better future.

Activities

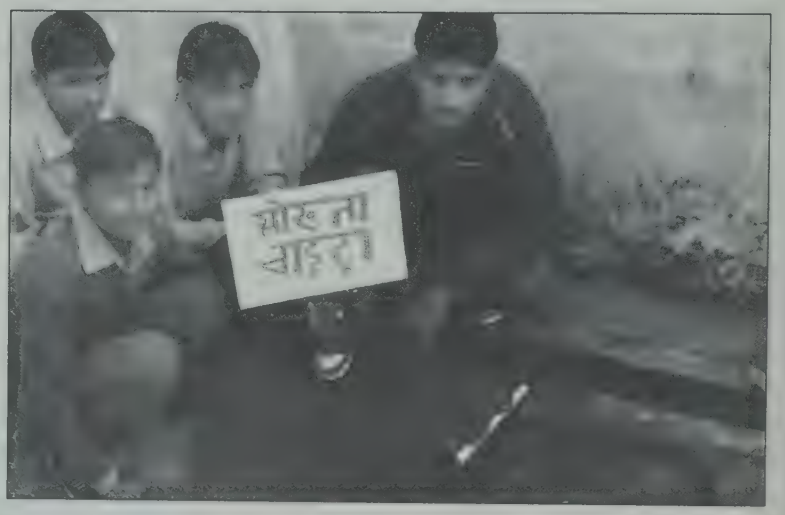
- Compile folk stories, songs, myths, poems and proverbs on nature.
- Interview a local crafts person like a potter, weaver, kite maker, block maker and printers. Find out about their history, materials that they use, how they learnt their craft etc.
- Look for motifs and designs which have been inspired from nature on different things we use everyday—textiles, pottery, ornaments, decorative items. Describe and document by these by drawing, photographing etc.
- Find out about the traditional ways of decorating our home and surroundings—kolam/rangolis, wall art, buntings and door hangings.
- Find out about plant products used for medicinal and wellness uses. Visit an ayurvedic shop and list the plant ingredients mentioned on various packages. Find out the common name and the local name.
- Make non-toxic colour from flowers, leaves, spices for decorating the school and house.
- Find out about the state tree and flower of different states of India. For example, India's national tree is Banyan tree and national flower is Lotus.
- Visit a traditional rain water harvesting, lake, river, pond, canal or well, and find out about water conservation, its history, etc.
- Research and compile a list of 10 common trees, flowers and birds in the area which have a cultural significance. For example flowers used in religious ceremonies, leaves of certain plants used for religious and decorations.
- Find out about the oldest tree/garden/orchards and sacred groves in the neighbourhood and its significance to local people.
- Find out how flowers are strung or woven together to make garlands as offerings in religious places, for decorating a place or courtyard. Find out what flowers are traditionally used and the beliefs behind it.

Culture and heritage offer us the wisdom and insight to guide the actions for sustainable living.

- Learn about cosmetics, traditional tattoos, mehendi, kajal, surma, etc. Find out why these were done? What were the ingredients used? Who used them? When did they use?
- Find out about vessels and implements used in the kitchens traditionally. What material are they made of? How are the shapes related to the food cooked or stored. See the match between form, function and use of local material (bamboo, metal, stone, clay, etc.).
- Compile the traditional ways of preserving food items—pickles, papads, jam and jellies, vadis, sun dried fruits and vegetables.
- Learn about the special dishes and savouries that are prepared during festivals and social occasions etc. Find out the ingredients that go into them, the seasonal and health linkages, and their cultural significance.
- Find out about traditional outdoor and indoor games which were played by your elders. Learn them and demonstrate the game in school.
- Find out from elders in the family or community on how and in what ways leisure time was spent. For example, was leisure time used for embroidery, story telling, reading epics or religious books, playing games, listening to music and so on.
- Find out about the common spaces used by people in villages, towns and city neighbourhoods where people gather to spend time. For example, courtyards, verandah (otla in Hindi and Gujarati, Arugu in Telugu) terraces etc.
- Find out about traditional swings inside the house and outside and their association with festival, social gatherings etc.

In the end, we will conserve only what we love, we will love only what we understand and we will understand only what we are taught.

Baba Dioum, Senegalese Conservationist.



That which can be learned in the classroom should be taught and that which can be best learned in the outdoors should there be taught.

V Beyond the Classroom

As a Paryavaran Mitra teacher, you have seen how you can effectively use so many different opportunities in the class, and textbooks, to help make your students are Paryavaran Mitra. Besides the class periods, students' learning and exposure can be greatly enhanced in many other ways.

Interaction with Resource Persons

In general while in school, students get to listen to their teachers and principal. Occasionally a guest speaker maybe invited. Usually this is on special occasions like Annual Day, Independence Day etc.

As a Paryavaran Mitra teacher you can invite a variety of resource persons to help your student learn about different aspects of the environment. For a Paryavaran Mitra, it is important to know about one's immediate environment. Who could be better for this than somebody from the community?

For example if the students were learning about issues of waste, inviting the Municipal Commissioner to talk about the waste management system of the city will be useful, but calling the local kabadiwala to tell students about his work with respect to dealing with waste will be equally informative. An interview with a rag picker will expose the students to aspects of waste management which they may not otherwise think about.

Inviting an expert in botany to talk about different plant species will be informative, but even the school gardener will be able to give a lot of practical information about local plants. When setting up a medicinal garden in the school, a traditional healer (vital) will be able to provide practical guidance.

The parents of the students will include a wide range of professionals who can become resource persons on different topics. This is also a wonderful opportunity to bring parents into the Paryavaran Mitra programme and to reach the messages to the home.

Outside the Classroom

When you take students outside the classroom you will notice that there is great change in the way they interact with you and their peers. Teaching and learning outside the classroom provides an altogether different experience. There are different ways to offer such experiences-- visits, field trips, nature trails, camping etc.

Visits: Visits need not require going far away, or getting too many permissions. Neither do you need to spend too much time or money. Interesting outings can be conducted even in the

That which can be learned in the classroom should be taught there, and that which can be best learned in the outdoors should there be taught.

short span of a couple of hours, and seldom need to exceed half-a-day, even when out of town programmes are arranged. Such outings provide great opportunities for students to develop skills of observation and recording. Whatever the duration, it is necessary to plan each trip carefully.

Visits to different sites and facilities provide opportunity for firsthand exposure and experiences. They help students to become aware of what is in and around their town/village/city. Schools often visit a zoo, a park or a historical monument. In addition to these, you could also plan visits to a nearby agricultural field, local pond, landfill site, sewage treatment plant, vegetable market and use these visits as educational opportunities.

For example, visit to a field will help students to understand different aspects of about agricultural biodiversity, cropping patterns, irrigation systems, seed and pesticides, etc.

Visit to a local pond can help students understand many different dimensions of water– Water as a resource, its uses, water and community, quality and quantity issues.

To teach different aspect of energy students can be taken to a power generation facility or a bio-gas plant, or a place where alternative energy sources 'solar/wind' are being used.

Some other places to visit which can be linked to different themes are suggested here.

Energy: Shops that sell cooking fuel, energy park.

Waste: Dump yard, recycling unit, kabadiwala shop, Municipal Waste Management facility, landfill site

Water: Traditional water conservation systems and structures, water filtration plant, waste water treatment plant, watershed development work.

Biodiversity: Grocery store, agricultural yards, public distribution shops, local markets to observe vegetable, fruit, fish and other food items, flowers, etc.

Culture: Places of religious worship, historical monuments, sacred groves, local craft persons, museums, etc.

Still other places to visit could be Science labs/centres and Planetarium.

Wherever you may decide to go, it is important that the visit should be planned properly. You should be clear about what you want to achieve through the visit. You should brief the children accordingly. You should also consolidate the learnings and experiences through discussions with the students after the visit.

Field trips: One need not go to a jungle to learn about plants, insects and birds. Getting to know about it through visiting local natural sites can provide valuable learnings. If you know where to look and how to guide the observations, you can provide your students with outdoor experiences even in towns and cities. Interesting outings can be conducted even in1-2 hours.

Earth and sky, woods and fields, lakes and rivers, the mountain and the sea, are excellent schoolmasters, and teach more than we can ever learn from books.
John Lubbock

A Paryavaran Mitra is a student who is not only aware of the local flora and fauna, as well as habitats, but who also understands the value of ecosystems, recognizes the linkages, identifies conservation threats, possible plans and participates in measures to address the local issues.

A local pond or lake will give a chance to observe aquatic life. A local park or field can be used for observing plants, insects and birds. A local sacred grove can also help to understand the conservation traditions and community protection of natural resources.

What is important is that every aspect of the trip is planned, keeping the educational objectives in mind.

Planning and Guiding Field Trips

Before the Outing: Select the site of the visit and decide upon the kinds of observation activities that would be appropriate e.g. if you plan to visit a local water body, such as a pond or lake, and then aquatic life can be observed. A city park can be used for observing plants, insects and birds. You could also plan special seasonal outings to see migratory birds. You can even plan a programme to observe the same area through all the seasons of the year. Students may find notable changes by visiting the same area at least once in two months.

Make sure to brief the students about the objectives of the outing, and what they should observe and record. They must carry notebooks for recording, and other items specific to the nature of the outing and site (e.g. binoculars, nets, etc.)

Inviting an experienced field person to join the outing will add a lot of educational value to the experience.

On the Field Trip: Outings provide an opportunity to use our otherwise neglected senses like hearing, smelling and feeling by touch. Tell students to avoid speaking amongst themselves as far as possible, and concentrate on detecting nature by keeping all their senses alert. Remind the students to observe carefully and record observations correctly and if possible also put sketches.

Tell students that they should not to collect specimens or damage the environment in any manner. Many a time one quite unconsciously plucks a leaf or flower or even a blade of grass which may be seeding. They should realise that the flowers and seeds that we unconsciously remove are part of the survival of that species. Another form of damage one must take care to avoid is trampling all over the place. By staying on used paths and trails one can ensure a great deal of conservation of our environment.

Remind students that a good test for every outdoor person is that no detective should be able to find any trace of their having visited the area. They must deposit the litter in the right place; or carry it back to deposit it at an appropriate place.

The real voyage of discovery consists not in seeking new landscapes but in having new eyes. *Marcel Proust*

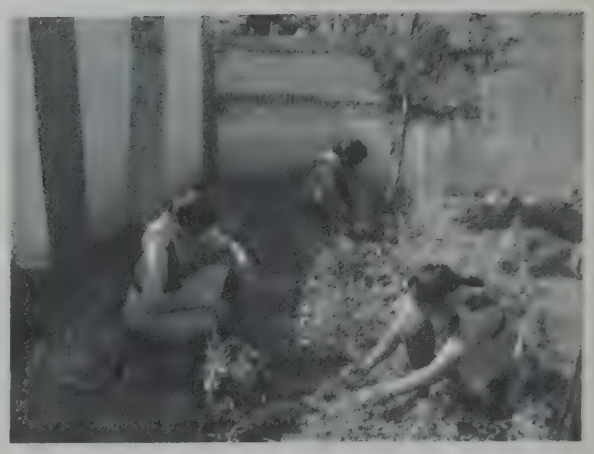
After the Trip: Observation notes can be cross-checked or confirmed by consulting field experts or library references. However, one can also begin on one's own and refer to expert(s) later. Consolidate the experience and learnings and make the links with the textbook topics and the Paryavaran Mitra themes.

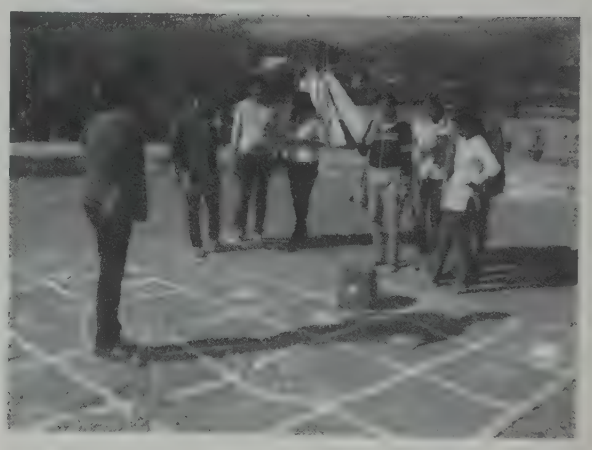
Guiding Observations: Observations and recordings can be more systematic if students had some structured worksheets or guidebooks. You will need to develop material which will suit your site and study focus.

Some basic guidelines are provided on the following pages for facilitating basic observation of plants, birds and insects. These could give you ideas for creating your own need-based worksheets. You could have individual observation sheets, or worksheet that combines several of these elements within your selected area, e.g. a park or garden.

Camping: A two-day camping experience can often provide more learning than a whole academic year. This learning is not only in terms of subject matter and environmental concepts but also, much more importantly, in developing life skills like interacting with a team, social cohesion, team work, interpersonal skills and also developing sensitivity and appreciation for nature.

It would be ideal to find out if there is any individual, organization or group which organizes regular camping programme in your area.





It's a good thing to learn more about nature in order to share this knowledge with children; it's even better if the adult and child learn about nature together. And it's a lot more fun.

Richard Louv

Hints for Plant Study

1. Study the shape
   Mast/pole, umbrella, lollipop, triangle, inverted triangle (also tall/medium/short).
2. Touch and feel the bark
   The texture - Rough, smooth; cracks, vertical, horizontal or both; or flakey, knobs, prickles, etc.
   Note and describe bark pattern also, if prominent.
3. Observe the arrangement of leaves
   Alternate, opposite, whorled.
4. Look at stipules and/or type of leaves
   Simple/compound; any speciality, tendrils, climbing organ, etc.
5. Feel the texture of the leaves
   Rough, smooth, waxy, sandpaperish, prominent veins, etc.
6. See the shape of leaves
   Associate with common objects like heart, arrowhead, spearhead, camel's foot, palm of a hand, etc. Sketch the shape.
7. Estimate the size of leaves
   Record dimensions using the metric system.
8. Observe where found
   Describe habitat - in forest/farm, near stream/pond, or barren patches, high hill, slopes, ridges etc.
9. Look at the type of arrangement of flowers
   Single, cluster, receme.
10. Find out when it flowers
    Describe flowers—size, colour, shape, smell, nectar, etc. Number of petals, tamens and ovaries.
11. Find out when does it fruit?
    Note seeds and method of dispersal if possible.
12. Name the plant.
    Ask a plant enthusiast if you don't know, or consult a reference book.
13. Find out economic uses.
    Edible/poisonous, medicinal, fuel, any other utility.
14. Check out life found on it
    a) Plant-epiphytes/parasites/other
    b) Animal - mainly insects and birds. Do also look out for amphibians, reptiles and even small mammals.

Hints for Bird Study

1. **Date, time, place, weather**

   Note sun, cloud and wind conditions like very sunny, sunny, moderate, shady, still, breezy, windy, etc.

2. **Size**

   Associate sizes with known species for easier recording.

   a) Sparrow - 1 5 cm
   b) Quail - 1 0-20 cm
   c) Bulbul-20 cm
   d) Myna - 23 cm
   e) Pigeon - 33 cm
   f) Partridge - 33 cm
   g) Crow - 43 cm
   h) Kite - 60 cm
   i) Duck - 60 cm
   j) Village Hen 45-75 cm
   k) Vulture - 90 cm

If the bird size is between a myna and a pigeon, it may be noted as Myna (+) or Pigeon (-).

3. **Shape**

Comparison of shape with well-known birds also helps in identification e.g.

Kite/hawk-like	Wader-like	Crow-like	Sunbird-like
Duck-like	Sparrow-like	Bulbul-like	Partridge-like
Crane-like	Pigeon-like	Jay-like	Owl-like etc.

4. **Outstanding features**

   Crest, long legs, beak, tail, eyebrow, eye-mask, or any other outstanding feature that draws one's attention first.

5. **Predominant colour and outstanding colour(s)**

   Colours of correctly named external features may be very helpful.

6. **Common features**

   a) Bill: hooked, straight, curving, upturned, spoon-like, long, short, thick, slender, conical, etc.

   b) Legs: long, stilt-like, short, feather covered etc.

      Feet: grasping, with claws/talons, webbed, elongated toes, etc.

c) Tail: long, short, forked, square-cut, notched, racket shape, graduated, curving, etc.

d) Eyes: colour, ringed, etc.

7. **Activity**

   Feeding (note and/or collect food), singing, flying (note mode of flight - e.g. swift, slow, flapping, undulating, gliding, etc.), territorial defence, courting, etc.

8. **Call notes/song**

   Songs are easy to remember if allied with some familiar sounds, words, phrases, etc. e.g. The Lapwing's "Did-you-do-it", or the Tailorbird's "Pretty-Pretty", or the Coppersmith's "Tonk-Tonk", etc.

9. **Habitat**

   Evergreen forest, marsh, hill slope, stream, seashore, farm, etc. Also mention the exact place frequented by the bird, e.g. tree canopy, bushes, ground, rocks, water, etc.

10. **Nest and nesting details**

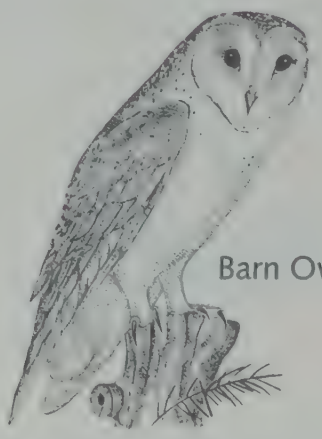
    Should you be lucky to spot nests, do note the size, shape, location, outstanding, features, colour and other pertinent details from a distance and without disturbing it.

11. **Other notings**

    Make notes of other aspects of behaviour. Birds may be found singly, in pairs, groups or in hunting parties with other species.

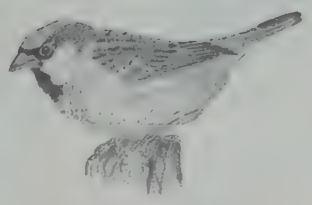
Common Pariah Kite

Indian Common Myna



Barn Owl

Blue Rock Pigeon



House sparrow

House crow

Hints for Insect Study

Place_____ Date _____ Time _____

Clear/Cloudy_____ Still/Breeze/Wind etc. _____

V. Sunny/Sunny/Moderate/V. Shady/Shady_____

No.	Insect types	Description*	Behaviour and Habitat**
1.	Ant and Ant-like		
2.	Beetle Types		
4.	Cricket		
3.	Grasshopper		
5.	Fly		
6.	Bee		
7.	Dragon-Fly		
8.	Butterfly/Moth		
9.	Worms (Arthropods like worms scorpions, spiders, etc.)		

* Observe and note size, outstanding characteristics, prominent colours, design, etc.

** Behaviour - doing what - walking, hopping, flying, eating, fighting, calling (describe sound)

Scorpion

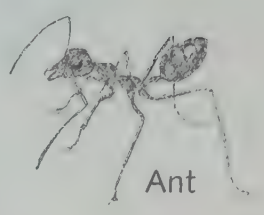
Spider

Dung beetle

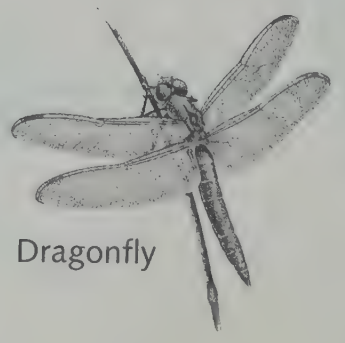
Bee

Butterfly

House Cricket



Ant



Dragonfly

House fly

VI Action Projects

The students of class 8 have done interesting activities in the class related to different aspects of waste. The students are curious to find out how these learnings apply to their own school. They decide that they would like to take up a project to reduce all types of waste in the school. They come to you for guidance.

You have done the different class activities given in section 3 of this Handbook. You found that these activities were effective to explain many of the textbook concepts. You feel that this process of learning- by-doing can be taken further by involving students in action projects.

You are an eco-club teacher-in-charge and you have seen that when they are doing club activities, students are motivated and engaged. So far, the club has been taking up assorted activities (a campaign, rally, exhibition etc.) which are more like events. You would like to channelize and sustain this motivation. You feel that taking up a long-term project that demonstrates some positive change will help to do this.

Your school has joined the Paryavaran Mitra programme and you are the teacher-in-charge of the Paryavaran Mitra activities. You are excited that this will provide an opportunity for the students to take a lead to bring about positive changes in the school. . You know that students have to be guided in this process. You would like to plan the process properly.

The situations given above indicate that the class activities have helped to raise the interest and motivational levels of students to go beyond the classroom and take on projects. This is a good time to plan an action project.

An Action Project can be undertaken within your regular classroom schedule, or as part of a club activity.

What is an Action Project?

An action project is an extensive task taken up by a group of students to apply or illustrate classroom learning. This extends the boundary of education from information to experience. An action project is bigger than the classroom and broader than the school, reaching into the community.

For a teacher, projects make teaching as well as learning, and assessment more meaningful, relevant and holistic. An action project is more than making models and charts. Action projects are made up of a series of activities planned to achieve a specified objective in a given time. The activities may not necessarily or formally be a part of the curriculum, but they can help to show the linkages between different subjects, and different aspects of a single topic. An action project requires planned and concerted effort.

Types of Action Projects

Projects can be of different types—ranging from a campaign to keep the school clean, to setting up a rainwater harvesting system.

Learning about the environment

Mapping, surveying and documenting the immediate environment.

- mapping water sources / trees and plants in the school and neighbourhood
- documenting traditional health practices, traditional conservation practices
- survey of soil types, irrigation practices, agricultural crops seeds, domestic biodiversity.

Addressing an environmental problem or issue

This could be in the school or community.

- stagnant water creating mosquito menace
- food wastage in the school
- careless use of electrical appliances
- paper wastage
- hygiene and sanitation
- waste management.

Improving the Environment

Developing and maintaining:

- a school garden
- a vegetable garden
- a medicinal garden
- a seed bank
- bird feeders and bird baths
- litter free school grounds
- resting sites
- clean toilets
- clean drinking water areas
- clean up of nearby monument/heritage sites .

Whatever you do may be insignificant but it is very important that you do it.

M. K. Gandhi

Why Action Projects?

- Provide first-hand opportunities to learn in, from and through the immediate environment. Make learning fun, practical and participatory.
- Involve real situations and people rather than only textbooks, providing a relevant educational experience. These help build an understanding of place, change, and relationships in real situations.
- Provide students a chance to discover the connections with the curriculum and the interdisciplinary linkages and the multiple dimensions of issues.
- Build skills that are difficult to acquire from rote learning, such as listening, talking, discussing, analyzing, communicating, and problem solving. Most importantly, students learn to plan and take corrective action.
- Encourage development of life skills such as creative and critical thinking, problem solving, decision-making, team work, negotiation and conflict resolution.
- Provide opportunities for students with different abilities to contribute.
- Stress cooperation and team work and develop leadership skills.
- Help students to develop self-reliance and responsibility, and understand the importance of planning and systematic organization of work.
- Help create role models. Students who have participated in such projects set examples for what could be accomplished. The students' enthusiasm and experiences are passed on to others who may also be inspired to take on such endeavours.
- Show results/achievements which motivate and empower learners. The opportunity to take part in a process with tangible results provides them a sense of control. They help the students to move from the feeling that 'I know but I can't help it' to the feeling that 'I know, I understand, and I can do something'.
- Provide skills to students to extend the learning beyond the school and apply to the community and society.

How to Plan and Carry out Action Projects

Planning

To successfully carry out a project and achieve its objectives, it should be planned well. Planning includes a series of steps which start with identifying a problem, defining the objectives, designing the process to achieve the expected outcomes. The planning process itself is a valuable educational experience for the students. Involve students in this process right from scratch including the critical decision on what project to take up. This creates a sense of ownership and active involvement from the start.

Developing an Action Plan

Once the students have decided to take up a specific action project, it is important to consider the following aspects.

Learning takes place both within the school and outside school. Learning is enriched if the two areas intersect with each other.

NCF 2005

Objective: The best is to begin with the question: "What is the problem?", "What do we hope to achieve by taking up this project? " This will help to define the objective of the project.

A clear objective will help to identify the required activities. This further helps to plan for time, space and resources required for it. Roles and responsibilities can be identified accordingly.

Time: The second question should be "how much time do we have for this project?"

For example, if the project is to be completed by the end of the school year in March, the students could plan a calendar of activities working backwards to the start of the academic year in June-July. So if the students have 20 weeks (and roughly 1-2 hours/week to achieve their objective) for example, they could plan the activities from week 1 to week 20.

Methods and Activities: An action project calls for a combination of different strategies, approaches and methods to achieve the specific objectives of each step of the process. The suitable activities and methods need to be identified and planned systematically and sequentially. These should add up to achieving the planned outcome. E.g. if the students hope to achieve a litter-free playground the activities will include survey of litter, creating awareness, creating systems and incentives for waste management and making sure these are in place (dustbins, compost pit etc.).

Resources: Students could list the resources (funds and expertise) required to carry out the project and begin to identify possible sources.

For example, if a tree plantation project is planned, they should identify where to obtain saplings, e.g., forest department, private nursery, etc.

If they require funds for carrying out the project, they could list possible sources e.g., contribution from school or students, corporate sponsorship, etc.

Involving the School: The entire school should be aware about and well informed about the project activities. Students must also think of ways they could inform the rest of the school or community about the project, and encourage them to follow its progress.

This could be accomplished through announcements at the assembly, creating a notice board for the project, updating it from time to time, organizing community meetings, etc.

Wide sharing of information about the project is important, especially if at some stage the project would require involvement of other members of the school or community. This also creates a climate of support for the project.

Implementing the Project: Once the project has been put into action, the action plan developed by the students would help them to carry out the activities and at the same time to track that the project is proceeding as planned—in terms of objectives to be achieved, the planned activities and the time schedule.

The mere formulation of a problem often is more essential than its solution.

Albert Einstein

Small group meetings with the student groups to periodically review and discuss the progress help to ensure that all steps of the project are followed in the proper sequence. Necessary modifications could be made after taking stock of the situation at each stage.

Documenting and Recording the Progress: Students should keep a record, individually or in groups, of the progress of the project, including weekly activities, setbacks if any, and unexpected findings or experiences. They must also record their own reactions and feelings about the activities, e.g. if the groups disagreed on a point, if an activity did not have full cooperation of the group, etc.

If it is a project such as greening, they could record observations about the progress of plantation—for example, how many days after sowing did the first sprouts appear; how many centimetres of growth of a sapling in one month, etc.

Photo documentation is an important way to keep record.

Besides being able to show what the project has achieved, it is also important to maintain a record of the progress of the project, not only for the group involved, but also to serve as a guide for other groups taking up similar projects. This will also help to continue the project by building on the achievements.

Assessing the Project: As the project nears completion, it is important for the students to assess the project. They could discuss how successfully, or otherwise, the project accomplished the objectives stated at the outset. They could also conduct surveys to determine how others in the school and community perceived and assessed the project.

Analyzing which aspects of the project worked well and which of them did not, as well as determining reasons for both, would be a very useful exercise.

They need to consider what changes or improvements they would suggest to another group of students who may decide to take up a similar project.

They need to think about how the project initiated by them could be sustained - for example how could they ensure that the trees planted by them continue to be nurtured, or how their achievement of a "Clean School" would endure.

The wider the possiblities we offer children, the more intense will be their motivations and the richer their experiences.
Loris Maloguzzi

Reflecting and Sharing

It is also important for both the teacher and students to assess the impact of the project on their own selves. Students should be encouraged to discuss their own experiences and feelings during the course of the project.

What did they learn from the project, not just in terms of information, but in terms of skills, interpersonal relations, communication, personal attitudes, and impact on their own behaviour, and those with whom they interacted during the project?

What did they like most, and least, about the experience?

Would they like to take up an action project again? If so, what would they do differently?

Before you begin make sure...

1. Does your project have a clear focus (environmental and educational goals)?
2. Are the objectives achievable in the given time frame?
3. Do you feel the time allocated for the project activities is enough?
4. Are the tasks in the project doable?
5. Have you informed the school authorities and taken the necessary permissions in writing?
6. Are resources required for running your project — money, human resources, equipment etc. available?
7. Are the roles and responsibilities clearly listed out?
8. Have you informed the appropriate people in the community/neighbourhood, if you are likely to carry out the project in the community or neighbourhood?
9. Does you project require any expert guidance? If yes, have you identified and informed the expert?
10. How do you plan to share your project outcomes with the entire school community?

Tell me, I forget. Show me, I remember. Involve me, I understand. *Ancient Chinese Proverb*

Projects: Step by Step

Any action project in order to be effective must be planned and implemented in a systematic fashion. The steps given below are the basic work flow plans that will guide in the project management.

Learning about the environment

Identify what is to be studied

↓

Develop a survey sheet

↓

Carry out the survey, document the information

↓

Compile the information

↓

Present the information (tables, graphs, charts, photos, illustration)

↓

Share the information with the school and community

↓

Make it available for the next batch of students

Addressing an environmental problem or issue

Collect the basic information to identify the problem

↓

Understand the area in which the project will be carried out

↓

Discuss possible solutions to the problem

↓

Develop a strategy

↓

Carry out the strategy

↓

Follow up

↓

Strategy for sustaining action

↓

Share with school and community.

Improving the Environment

Identify/choose the project site

↓

Gather information/learn about it

↓

Plan the project

↓

Implement the project

↓

Document and communicate

↓

Strategy to ensure sustainability

↓

Share with school and community.

To raise new questions, new possibilities to regard old problems from a new angle requires creative imagination, and marks real advances in science.

Albert Einstein

Action Projects: Overview

This section includes the following	
Schools Did It!	Shares a case study of an action project carried out by students in a school. The case highlights the role of the teacher, the different steps in the process, and the achievement of the students.
Read and Reflect	These short questions will help you to reflect on the case and also to consider how this experience may be relevant or useful in your own context—class, club or school.
Steps in the Process	Provides an overall picture of the sequence of different activities undertaken by the students in order to achieve the planned outcomes.
Skills Framework	A listing of the wide range of skills that the process has helped to develop in students.
Methods and Activities	The sequence of activities each building upon the previous, that made up the process to achieve the project objectives.
Learning Outcomes	Indicates what the students will gain in terms of overall learning.
Report Card	Indicates how students could bring about positive change by going through the steps—Explore, Discover, Think, Share, Act.

Schools Did It!

Saving Every Drop

Students of Eagle eco club of Boormajra School, under the guidance of Baljeet Kaur, the teacher in-charge of the eco club, took up a **water audit** in their school campus to understand the **water consumption** pattern. Eco club students formed teams and each team took up the responsibility of a component of water audit. While one team of students focused on the **water sources**, the other concentrated on the **water use**.

The teams found out that the main source of water in the school was bore well from where water was pumped to an overhead storage tank. Teams also calculated the capacity of the **storage** tank which was 1500 litres. While doing the assessment of the daily consumption of water, students measured the level of water in the storage tanks in the morning hours and at the end of the day, after school hours, before going home. The difference in the volume indicated the volume of water consumed in a day. Students also calculated **per capita consumption** per day by dividing the total volume of water consumed by the number of students and staff which was 400. This exercise was repeated over one week in different periods / seasons. The average water spillage water consumption calculated was 3.82 litres per capita per day which meant there was almost no water left in the overhead tank towards the end of the day. During the auditing exercise, leaks were noticed in the water taps due to improper closing of taps, spillage during water collection and so on.

Following the audit, the eco club team tried to boost **awareness amongst the rest of the school students** on water conservation. They observed important environmental days, organised a number of competitions in the school like slogan writing, poster making, rallies. Following intensive awareness programmes over a couple of months, students took up a **second round of water audit** to measure the impact of the awareness programme. At the end of the audit, eco club students were happy to record a reduction of more than one litre per capita per day, from 3.82 litres to 2.5 litres.

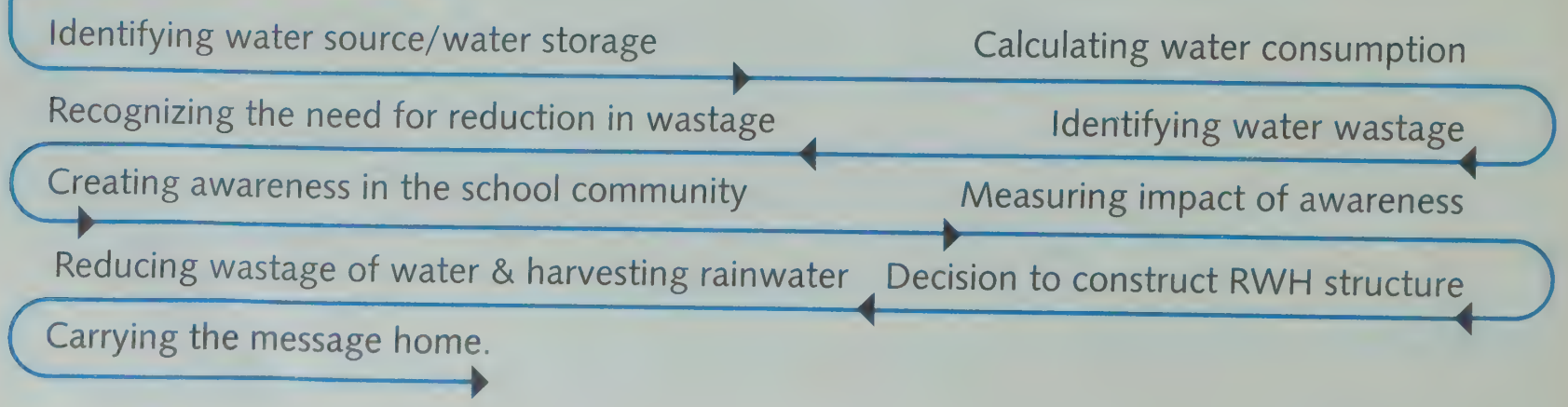
The audit helped to quantify water that was getting wasted. Even before the audit exercise, few cement troughs were built under the water taps to save the wastage of water. The leaking water collected in these troughs was used for watering the school garden. A narrow drain was constructed at the end of the troughs and the water flow to the plants was controlled by intermittent blocking of the drain. The overflowing water from troughs was collected in buckets by the students for the various uses in the school.

Students also measured the total quantity of water collected in troughs which was to the tune of about 550 litres. This alarming quantity of water spillage made the eco club team launch an awareness drive in the school campus.

Students with the help of their teacher also collected water consumption data of urban and rural schools, some from the teachers, Principals and students residences and from various other sources including some publications. The data obtained was analysed and plotted graphically. Students from this analysis found that the water consumption of urban schools with Rain Water Harvesting pit was far more than that of their counterparts in rural areas. They compared their school data which fell under the rural category and found that their school consumed less water as compared to the other rural schools. Students and teachers concluded that their awareness programmes were effective and indeed led to conservation of water in the school. The effort also helped in saving electricity used for pumping the water. So it was a double benefit.

Eco club team further took a step forward and decided to **construct a water harvesting structure**. Punjab State Council for Science and Technology which is the nodal agency for the NGC programme in the State gave a grant of Rs.10,000 for this purpose. Students calculated the total area of the school and the total roof area prior to construction of the structure to design the rain water harvesting (RWH) structure. They calculated the annual rainwater harvested by considering average rainfall of 60 cm per year. Of the total roof area of 1 700 square meters, water harvesting was planned from 228 square meters. With this partial roof water harvesting, the school was able to collect and recharge 1,16,280 litres per year. Troughs used to collect water spillage also collected rain water. Water from the troughs was utilised for gardening and washing floors. This has not stopped at the school level. Almost every student has attempted to use cement troughs in their homes to hold the dripping **water at the household level.** Over a period of two years, the eco club has helped the school not only to reduce the consumption and wastage of water but also to harvest and recharge considerable amount of rainwater.

Steps in the Process


Identifying water source/water storage
Calculating water consumption
Identifying water wastage
Recognizing the need for reduction in wastage
Creating awareness in the school community
Measuring impact of awareness
Decision to construct RWH structure
Reducing wastage of water & harvesting rainwater
Carrying the message home.

Read and Reflect

Q1. Which of these did this project **not** cover?

- water storage system in the school ☐
- per capita per day water consumption ☐
- identifying water wastage ☐
- clean toilets ☐

Q2. What did the Water Audit **not** help to do?

- understand the water consumption pattern ☐
- calculate per capita, per day consumption ☐
- find out the source and storage system for water ☐
- find out about water borne diseases ☐

Q3. Which of these steps contributed to the student's success in water conservation efforts?

- creating awareness about water wastage ☐
- diverting overflow water for school garden ☐
- constructing water harvesting structure ☐

Q4. This case describes some of the possible aspects of the theme Water. If you were to take up a Water project in your school, what aspects of water would do you think would be important for your school?

- reducing water wastage in the school ☐
- waste Water Management (reusing waste water) ☐
- cleaning up the local water body ☐
- reusing waste water ☐
- provision of safe drinking water (bringing, storing and using water) ☐
- awareness about importance of clean water and safe drinking water in the school ☐
- no stagnant water in and around the school. ☐
- clean Toilets for all ☐
- RWH structure ☐
- Any other… ☐

Q5. If you were to address any one or more of these issues and you had to guide your students to take up a project for this, what all will you need?

- students should understand the issue (knowledge and information) ☐
- time to plan and carry out the activities ☐
- support of the school management ☐
- involvement of other teachers ☐
- help of other school staff ☐
- any other… ☐

Methods and Activities

- Survey
- Water Audit
- Awareness campaign
- Building troughs to divert overflow water
- Secondary data collection and analysis
- Constructing rainwater harvesting structure

Skills

- Observing and recording
- Developing tools to measure and calculate
- Compiling and analysis of data
- Inferring
- Recognizing and articulating the problem
- Reporting and presentation
- Communication
- Working in teams
- Planning and strategizing
- Problem solving

Learning Outcomes

- Understand the source and storage systems of water in the school
- Identify causes and consequences of water wastage in the school
- Understand different ways of harvesting water

Report Card

Water

Explore & Discover
- Map, survey and document school water system
- Calculate quantity of water consumed
- Estimate water wasted by the school.

Think
- Develop skills of observation, recording, calculation
- Analyse and compare data

Share
- Communicate to the rest of school
- Involve the school in Action plan

Act
- Establish rainwater harvesting structure

Change: Reduce water wastage • Provide for sustained water collection and conservation

A Paryavaran Mitra school !

Schools Did It!

High Voltage Action

Sudheer D. Nayak, the teacher in-charge of the Samrudhi eco club of Bisgod High School, Yellapur along with students undertook **literature survey** to find out the impact of electricity generation process on global warming. Their findings revealed that India is the world's 6th largest energy consuming country, accounting for 3.4% of global energy consumption; that electricity in India is generated from both renewable (water, wind) and non renewable community survey resources (coal); that 63% of India's electricity requirement is met from coal fired thermal power plants; that carbon dioxide (CO_2) released into the atmosphere during coal burning is an important greenhouse gas causing global warming.

A talk by the Deputy Conservator of Forests, Yellapur Division helped students to further realise the pronounced impact of global warming due to depleting forest cover. **Realising the importance of electricity and its optimum utilisation** without much wastage, the eco club team tried to find solutions to this problem.

One of the **solutions suggested** was the use of the Compact Fluorescent Lamps (CFL). The team **decided to** study the performance of CFL themselves before promoting such an idea. Though CFL was more expensive than normal incandescent bulbs, it's efficiency was higher and life span longer. For a given light output, CFL consumed about one third to one fifth of electricity of that of an incandescent lamp. This saved electricity, money, and reduced burning of coal thereby reducing the carbon dioxide emissions to a large extent.

Students then **planned an awareness programme** on the importance of conservation of electricity for other students of the school and the community members. With the help of their teacher, students prepared **a questionnaire to assess different kinds or bulbs, lights and their numbers used by the people in their houses**. **They surveyed 100 households from 8 surrounding villages**. Electricity bills of various households were also collected / noted.

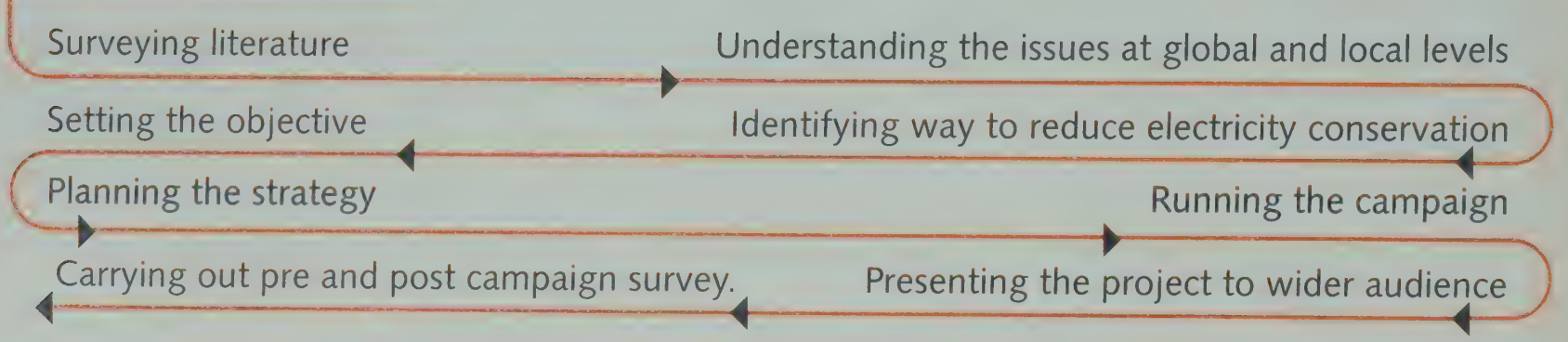
After **analysing the data collected through the household survey**, students started a **save energy campaign** in about a 2 km radius around the school. They designed and distributed energy conservation **pamphlets** among community members. Copies of these pamphlets were also sent to neighbouring villages where the survey was undertaken. Students then decided to promote the use of CFL to help save electricity. **Door-to-door**

campaign was undertaken to explain the advantage of CFL over the incandescent bulb. Eco club teacher, with the help of the drawing teacher and students **painted the school wall with messages** on energy conservation to educate the community at large.

Two months later, after this enthusiastic campaign, students undertook **another survey**. During the first survey people in all the surveyed villages largely used incandescent bulbs. The second survey results showed that of the 100 households surveyed across 8 villages, 86 households had started using at least one CFL in their respective homes. Electricity bills were again collected during the second **survey to find out the savings in electricity**. There was **a reduction in the household electricity bill** which was pointed out to the households. These efforts of students were represented in the **16th National Children's Science Congress, 2008** and was appreciated by various officials including the officials of the education department.

This initiative of the young and energetic brigade has yielded great results in terms of not only of **energy conservation** but as an example of Education for Sustainable Development. Far from the cities, such quiet yet powerful campaigns in smaller towns, yielding positive results are much required to educate high energy consumers.

Steps in the Process


Surveying literature
Understanding the issues at global and local levels
Identifying way to reduce electricity conservation
Setting the objective
Planning the strategy
Running the campaign
Presenting the project to wider audience
Carrying out pre and post campaign survey.

Read and Reflect

Q.1 From where did the students gain the information and knowledge about electricity generation, its use in India and the link to global warming?

- From newspapers ☐
- From films ☐
- From the teacher ☐
- By doing literature survey (reading books and articles) ☐

Q.2 What did the students decide to do to promote electricity conservation?

- Promote use of CFL ☐
- Propose "no light" hour in the village ☐

Q.3 How did the students convey the message that CFLs are an efficient lighting option, and that all households should switch to CFL?

- Door-to-door campaign ☐
- Pamphlets ☐

Q.4 How did the students find out about the household electricity consumption in the village?

- Developed a questionnaire for household survey ☐
- Collected electricity bills from households ☐
- Both the above ☐

Q.5 Have your students ever carried out any project or activities that involve household survey?

- If yes what was the survey about? ☐
- If No, why not? ☐

Q.6 What aspects did the project not cover?

- Disposal of CFLs ☐
- LED as an alternative to CFL ☐

Methods and Activities

- Survey
- Expert Talk
- Experiment
- Campaign

Skills

- Using primary and secondary sources of information
- Designing questionnaire
- Developing hypothesis based on information, testing and analysis.
- Compiling and analysis of data
- Research and experimenting
- Planning campaign
- Communicating

Learning Outcomes

- Understand the need for conservation of electricity
- Understanding how appropriate technology can help to optimize electricity use.

Report Card

Energy

Explore & Discover
- Survey of literature, learn from experts
- Realize the importance of electricity and its optimum utilization
- Trial and test before suggesting solution
- Survey household electricity consumption- before and after

Think
- Planning awareness programme
- Analyze data

Share
- Campaigns
- Communicate through different methods
- Share at national forum

Act
- Focussed "save energy" campaign in school and neighbourhood.

Change: Reduction in household electricity bill

A Paryavaran Mitra school !

Schools Did It!

Conserving Precious Resources

The Haritha eco club of the Government Upper Primary School located in Thavidissery in Kannur district of Kerala has **put in almost six long years** of hard work to protect the local biodiversity of the area. What did they do?

The school, situated on a laterite plateau, receives abundant rainfall (3500 mm of average annual rainfall). Unfortunately due to the terrain, which is largely lateritic hard rock with grasses, shrubs and small thickets, most of this **water was lost as run off**. Water resources would dry up by December in the school and its surrounding areas. With the advent of summer, much of the vegetation in the area would be lost to the fires. Besides these problems, the local community would harvest vegetation from the 6 acre school campus for firewood and green manure.

After analysing these problems, the eco club teacher in-charge, the school management as well as the club members came up with the idea of protecting the biodiversity. As a first step they planned to **conserve water** as it was essential for biodiversity conservation. The eco club members along with the teacher in-charge and **school management**, in association with the **Parent Teacher Association (PTA)** embarked upon the task of conserving the biodiversity of the area. Local government bodies **(District Panchayat)** and **community organisations** supported this initiative.

The eco club members first conducted a series of **awareness programmes including camps and campaigns to spread the message of the importance of biodiversity among students, parents and local people**. The school also demarcated **6 acres** of its land and prohibited the collection of firewood and green manure. **Out of these 6 acres, a 3 acre area was 'protected' by constructing a compound wall, and 0.5 acre was left completely untouched, away from any local and outside influence.** Appropriate steps were also taken to regulate fire and grazing by the cattle.

Pits for arresting rainwater run off were dug with the support of Kudumbashree (Kerala Government's largest women empowerment project in India). **Two ferro-cement tanks of the capacity of 24,000 liters and 10,000 liters for collecting rainwater** were constructed with the help of Jalanidhi (a project of the Government of Kerala on rural water supply and sanitation).

Several tree species suitable to the region such as Mahagani (Swietenia macrophylla), Teak (Tectona grandis), Sandal (Santalurn album), Kambakam (Hopea parvi flora), Ashoka (Saraca indica) were planted with the objective of arresting run off. **Plantation was undertaken with the help of Kudumbashree. A medicinal plant garden and a vegetable garden were also established on the school campus.**

These steps initiated by the eco club members of the school have had a great influence on the water availability of the area and thereby on the biodiversity. The **water table in the area has improved** as is indicated by the availability of water in the open well in the school. The 6 acre school premise has become **clean and green** in 6 years. Some plant species endemic to lateritic areas such as Glory lilly (Gloriosa superba), Drosera (Drosera capensis - insectivorous plant), Utriculeria species (insectivorous plant) have regenerated in the school campus. These diverse plant species have **attracted a number or birds and butterflies to the area.** Produce obtained from the **vegetable garden is used in school's mid day meal preparations**. Rain water collected in **the rainwater harvesting tanks is used for cooking the mid day meals and also utilised for watering plants** on the campus once in a while. The PTA members and the local community continue to support the programme. They regularly help **in desilting the rainwater harvesting pits**. The local community has stopped collecting fuel wood from the campus which has helped in maintaining the greenery.

In the process of conserving water and protecting biodiversity, this initiative may impact **the microclimate and also act as carbon sink**, besides benefiting the school and the community. This small but important initiative illustrates how coordination among various programmes can be brought in to implement programmes effectively resulting in sustainable development.

Steps in the Process

Identifying the problem related to water, and the cause of the problem

Understanding the link between water conservation and biodiversity conservation

Planning a multi pronged strategy to address the problem

Identifying and working with relevant agencies to implement the programme

Undertaking a number of different activities towards achieving the objective

Carrying out awareness campaigns

Sustaining support of community.

Read and Reflect

Q.1 The students and teachers of the school were helped in their work by the following:

- Parent Teacher Association (PTA) ☐
- Local government bodies (District Panchayat) ☐
- Community organisations (Kudumbashree) ☐
- Jalanidhi project (government scheme) ☐
- All the above ☐

Q.2 What measures helped to reduce rainwater run off and to conserve the water

- Digging pits ☐
- Building ferro cement tanks ☐
- Plantation ☐
- Deepening the local pond ☐

Q.3 As you read the programme has been continuing since 6 years. Do you think that only one teacher would have been managing to run the programme all this time? How do you think different teachers may have been involved?

- _____ ☐
- _____ ☐
- _____ ☐

Q.4 If you took up a similar programme in your school, which are the agencies in your area who could help you?

- _____ ☐
- _____ ☐
- _____ ☐

Q.5 The students main objective was to save water and save biodiversity. As you have seen, their activities resulted in many more benefits. Which of these did the project **not** do?

- Saved soil ☐
- Vegetable garden which contributed to mid day meal ☐
- Rainwater collected and used for campus ☐
- School became clean and green ☐
- Endemic species regenerated ☐
- Saved electricity ☐

Methods and Activities

- Demarcating an area as protected from any disturbance
- Digging pits for harvesting rainwater run off and making tanks to collect rainwater
- Planting local tree species
- Establishing vegetable and medicinal garden on the campus
- Desilting rainwater tanks with the help of parents and community.

Skills

- Identifying problems
- Analyzing a problem
- Recognizing the linkages (cause and effect)
- Developing collaboration
- Creating awareness
- Planning and strategizing
- Developing demonstration sites.

Learning Outcomes

- Understand the close interrelationships in nature
- Understand the importance and value of harnessing rainwater run off for improving the local biodiversity and water table
- Understand the value of cooperative action.

Report Card

Biodiversity and Greening

Explore & Discover
- Analyze the issues linked to water run off and loss of vegetation
- Understand the link between water conservation and biodiversity conservation

Think
- Plan how to conserve water
- Strategize whom to involve in this initiative
- Develop multi-pronged strategy to address the issues

Share
- Spread message of importance of biodiversity to community
- Inform about measures to regulate use of resources

Act
- Protection of certain areas
- Harvesting rainwater run off
- Plantation — trees and other vegetation
- Desilting of rainwater harvesting pits

Change: Water conservation • Clean and green school premises • Increase in local biodiversity

A Paryavaran Mitra school !

Schools Did It!

Community Waste Management

Waste is a problem in most places. Turning waste into resource is challenging. The eco club students of Birati Mahajati Vidyamandir School took up this challenge. This **higher secondary school** is located in Birati which forms a part of Greater Kolkatta. Teacher in-charge and students of the eco club of the school undertook a programme **to find a solution to the problem of solid waste in the areas around the school**. In **collaboration with the West Bengal Pollution Control Board (WBPCB) and the Dum Dum Municipality** and with the representative members of the **local society** (Mahajati Nagar Unnayan Society), the eco club students planned the waste management programme for the area.

As the first step, the eco club team involved other students of the school in the initial household survey. **14 teams of students of 6th to 9th standard surveyed 50 households** to assess the quantity and the type of waste generated. Data on the daily waste generated was collected and the **monthly average calculated**. Following this, students through **door to door campaign** educated the residents on the **quantity and types of wastes generated** in their locality (organic, inorganic; degradable, non degradable, recyclable). Residents were requested to segregate waste prior to its disposal so that it becomes easy to manage, since different types of waste have to be treated differently and separately.

After the **initial awareness on waste segregation**, 30 households were selected in the locality on pilot basis and **a compost pit was dug in each household**. Residents were persuaded to compost the organic waste. **Inorganic waste** segregated by the residents was **collected by the Municipality**. Today the programme boasts of **500 compost pits in 500 households**.

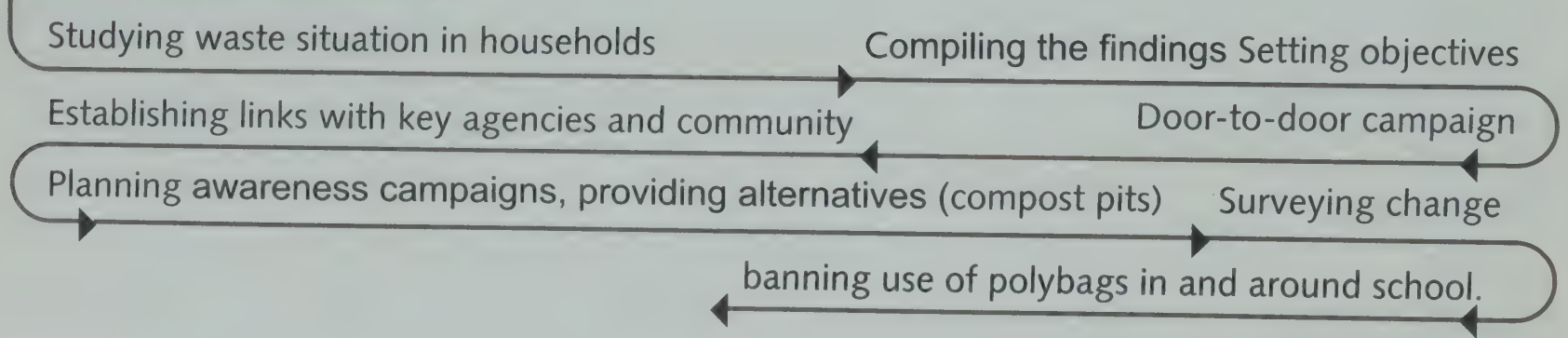
Three compost pits were dug in the school. Organic waste collected in the school was composted in these pits. Some of the eco club students even brought extra waste from their homes and composted in these school pits. Compost generated in the school was used **in the school kitchen garden**.

Having addressed the problem of waste disposal from households, eco club team decided to **target nearby markets and schools** to tackle the problem of plastic carry bags. **Krishnendu Sinha, the school Principal supported the programme and held several meetings to discuss the ill effects of plastics with the shop owners and Principals of**

the five selected schools. The school collaborated with the WBPCB and the municipality. With funding support from the **WBPCB, a tableau w**as put together by the eco club team for awareness creation. Students took the tableau to markets and the target schools a number of times. **Posters, banners and appeals** were also used to create awareness. Students **distributed paper carry bags** funded by the WBPCB, municipality and the school to customers and shop keepers. In order to know the impact of their awareness campaign, eco club team undertook a **pre and post survey- before and after the plastic awareness campaign.** Pre survey showed that 50% of the shop keepers and 70% of teachers and students were aware of the problems related to plastic carry bags. Post survey revealed that the level of awareness had risen by over 80% following the campaign which was also evident on ground. **Schools had banned the use of poly bag**s on the campus and the **markets too had ba**nned the use of thin plastic bags under 40 microns.

The effort of the eco club team in this direction has won the school the certificate of excellence by the School of Fundamental Research which is the State agency for the implementation of the National Environmental Awareness Campaign in West Bengal. The school has also received the best eco club award of the State on a number of occasions. The young green brigade has certainly shown the path to manage waste locally by their sheer interest, thinking, hard work, systematic planning, and execution.

Steps in the Process


Studying waste situation in households
Compiling the findings Setting objectives
Establishing links with key agencies and community
Door-to-door campaign
Planning awareness campaigns, providing alternatives (compost pits)
Surveying change
banning use of polybags in and around school.

Read and Reflect

Q.1 How many students, from which classes took part in this programme?

- _____ ☐
- _____ ☐
- _____ ☐

Q.2 Which agencies did the students take the help for this project?

- _____ ☐
- _____ ☐
- _____ ☐

Q.3 What were the households requested to do with their waste?

- To segregate their waste ☐
- To have a compost pit ☐
- To burn the inorganic waste ☐

Q.4 How did the school principal support the programme?

- _____ ☐
- _____ ☐
- _____ ☐

Q.5. How can you make your school a zero waste school?

Methods and Activities

- Survey
- Awareness campaign
- Setting up demonstration units
- Reaching out to the community.

Skills

- Recognizing and articulating the problem
- Compiling, analysis, calculating, inferring
- Planning multi-pronged strategy, including linkages with key organizations
- Developing communication strategies and materials
- Working in teams
- Critical and creative thinking
- Problem-solving
- Developing cooperative strategies.

Learning Outcomes

- Understanding that waste management requires a combination of different strategies
- School students can initiate change at home and community level
- Different stakeholders are important to bring about effective change to happen.

Report Card

Waste Management

Explore & Discover
- Survey to assess quantity and quality of household waste
- Calculate monthly average
- Pre and post campaign surveys

Think
- How to tackle problem of solid waste in areas around school
- Which agencies could help in tackling this
- What strategies to adopt

Share
- Door to door awareness campaign
- Demonstrating compost pits
- Tableaux, posters, banners in nearby market

Act
- Set up compost pits
- Distribute paper carry bags

Change: Compost pits in 500 households and in school.
- School and market banned use of polybags.

A Paryavaran Mitra school !

Schools Did It!

Parinda Abhiyan

Bird feeder, popularly known as 'Parinda' across Rajasthan is an **integral part of the culture of the State**.

Saraswati Bal Veena Bharati Senior Secondary School in Jodhpur has been actively involved since 2005 in the **installation of bird feeders** or parindas. Andharam Choudhry, the eco club teacher and his students, with the support of the principal Bhuraram Choudhry, initiated the **bird feeder movement** called Parinda Abhiyan. **The bird feeders made out of thin metallic sheet, and bird baths created out of soil and baked, costing between Rs. 5 and 8, were installed in their school campus.** To begin with, students installed 25 bird feeders and 25 bird baths on every tree on their campus.

Then the teacher and students moved on to the school neighbourhood and **motivated the community members to participate in the programme.** Bird feeders and bird baths were installed in homes, government offices, temples, schools, panchayat offices, parks with the active participation of the local people. Students requested people to regularly fill grain and water in the bird feeders and bird baths.

Encouraged by the reaction and action, the eco club students went around the nearby villages to **revive this traditional practice**. First, they **targeted 25 neighbouring villages** from where students came to Saraswati Bal Veena Bharati School to study. During the summer vacation between mid May to the end of June, eco club students along with their teacher planned programmes to reach out to the local communities in selected villages. They carried bird feeders and bird baths with them to **demonstrate the practice**. A group of about 10 eco club students accompanied by the teacher would go in the Principal's jeep to these villages to initiate awareness and motivate people to join Parinda Abhiyan. Students would talk to the gathered crowd about the need for the bird **feeders and demonstrate the installation of the feeders**. They would also **allot responsibility of refilling these feeders to certain individuals of the village.**

Students coming from these villages would then be assigned the **task of monitoring these feeders**.

The eco club students have tried to cover almost every village falling in the radius of about 50 kilometres. Besides one-to-one interactions to promote bird feeders, students have also **adopted other means such as rallies, street plays, cultural programmes, distribution of pamphlets - to communicate the message and motivate people to revive the tradition of bird feeders**. All these efforts by the students and the teacher of eco club has paid off. Over the last five years about 3000 bird feeders have been installed in the region, some by students and others by the community members.

As a part of the activity extension, eco club members have also been successful in **motivating villagers to construct small tanks in pasture lands**. The cost of construction of the tank is Rs. 1500, and this is **funded by the school trust**. These water tanks help meet the water requirements of larger animals like deer, besides birds which inhabit pasture lands. The eco club members have so far helped in the construction of 10 such tanks in the surrounding villages. Villagers take up the responsibility of filling water in these tanks with the help of water tankers.

The Bharat Scouts and Guides, the nodal agency of NGC in Rajasthan, initiated state level Parinda Abhiyan in 2005 and in a period of over 5 years 1,68,332 bird feeders have been installed across the state. Today, Parinda Abhiyan is a State level event and bird feeders and baths are being installed in every district by the eco club students, funded by NGC.

Started as a small initiative, this is now a state level activity. This **"school to state"** success story to revive the age old traditional practice from the point of conservation by the young populace involving local communities is undoubtedly an inspiring step towards systematic approach to sustainable development.

Steps in the Process

Setting the objective to revive bird feeding practice

Setting up demonstration feeders in the school

Extending the activity to the different places in the community

Motivating people from community to participate actively

Assigning role and responsibilities for maintaining the feeders

Monitoring

Outreach and awareness programmes

Extending the scope of the objective to include other conservation measures.

Read and Reflect

Q.1. What are some of the traditional practices in your area that are to do with caring for animals (like a bird feeder in this example)?

_____

_____

Q.2. This campaign became effective and sustainable due to the following reasons:

- The students demonstrated how to make a low cost bird feeder and set it up ☐
- Bird feeders and bird baths were installed in homes, government offices, temples, schools, panchayat offices, parks with the active participation of the local people ☐
- The students motivated the community members to actively participate in setting up and maintaining the feeders. ☐

Q.3. School can influence the community! Would you agree with this statement after reading this story?

Has your school ever taken up a project that has gone beyond the school to the community?

Methods and Activities

- Setting up bird feeders on campus
- Demonstrating the practice to the community
- Motivating community to join the campaign
- Involving the community to take up responsibility
- Motivating villagers to construct water tanks to care for other animals
- Planning and running awareness campaigns.

Skills

- Communicating messages
- Motivating community
- Demonstrating suitable practices
- Planning and strategizing
- Developing cooperative strategies
- Monitoring

Learning Outcomes

- Understanding the value of traditional practices for conservation
- Understanding the important role of community participation for scaling up and sustaining the initiative.

Report Card

Culture and Heritage

Steps to become Paryavaran Mitra

Explore & Discover
- How to revive the traditional practice
- How to set up demonstration units
- How to involve the community
- Strategize how to sustain community ownership

Share
- Going to communities to create awareness – through variety of methods
- Demonstrate setting up of feeders
- Spreading the messages to a wider area

Act
- Demonstrate and set up bird feeders
- Allocate responsibility for maintenance
- Set up monitoring systems

Change: 3000 bird feeders installed in the area, maintained by the community
- Villagers motivated to set up other conservation measures.

A Paryavaran Mitra school !

VII A Paryavaran Mitra School

You are the Headmaster. Your school has joined the Paryavaran Mitra programme. You are keen to make the entire school into a Paryavaran Mitra school. You don't want to limit Paryavaran Mitra activities to a few classes and club students, but wish that all the students relate to this programme in some way. You have called a meeting of all the teachers to discuss this.

Students of your school are organized into 4 Houses. The students of each house are to conduct awareness activities for one month each. Each month is to have a different theme. As a teacher in charge you suggest that they could use the calendar of environmental days to plan the activities for this year.

You are the language teacher. Your school has joined the Paryavaran Mitra programme. The principal decides that a separate bulletin board be placed in the corridor and this will be the Paryavaran Mitra news board. The principal assigns you, along with the art and crafts teachers, to be in-charge of this. You wonder how this board can be best used for this purpose.

You are the PE teacher, and along with one primary and one high school teacher, you have been asked to plan the school annual day and sports day. The principal is keen that this year both these should reflect an environmental theme and all the events and programmes should be planned around this. As a run up to the annual day, you have to suggest the themes for various competitions to be conducted during the year. You need to collect ideas for this.

As the SUPW/Craft teacher you have been assigned the task of planning the celebration of festivals in the school. You decide to do this differently, so that in addition to the cultural and traditional aspects, the festival celebrations also carry environmental messages. You are looking for ideas.

It is important that the entire school gets to know about the Paryavaran Mitra programme and participates in different ways towards making the school a Paryavaran Mitra school.

There are many ways in which different teachers can take the lead in this.

A Paryavaran Mitra school is one which reflects the spirit of Explore, Think, Discover and Act in every aspect. This envisages the active participation of all students, teaches and the rest of the school staff in different ways. It also means that all the different opportunities in terms of time and space are creatively and effectively used for this.

The first step is to identify the opportunities for this your school. This can be done by the reviewing the following.

On what occasions does the entire school come together?

Assembly	☐	Sports Day	☐	Annual Day School	☐
Competitions	☐	Film shows	☐	National days	☐
Visitor to the school	☐	PTA meetings	☐	Any other occasions	☐

What usually happens when the whole school gets together?

Prayer	☐	Singing the School Song/National Anthem	☐
Principal's talk	☐	News reading/thought for the day	☐
Talk by the guest	☐	Announcements	☐

Competitions (quiz, debates, elocution, recitation, extempore)

What else can be done?

As a Paryavaran Mitra school how can these opportunities be used for sharing the work done by students, and to convey environment-related messages?

Sharing findings of surveys and audits.

Involving whole school community in activities. For example participation in plantation drive, cleanliness campaign, etc.

Involving parents/community and other teachers.

Announcing events related to Paryavaran Mitra and other days.

How can this be done?

Assembly	☐	Bulletin board	☐	School days	☐
Competitions	☐	Festivals	☐	Mela and fairs	☐
Celebrating environmental days	☐				

What are the benefits of such sharing or involving the entire school?

Wide publicity	☐
Greater participation	☐
Sharing of learnings and findings	☐
A feeling of working for a common cause and a feeling of ownership	☐
Building the esteem of a class	☐

The following pages provide some ideas on how the different opportunities that the school time and space provide can be effectively used.

Using the Assembly: This need not be only the time to read news and thought for the day. Use this chance when the whole school is together to share updates on Paryavaran Mitra activities (e.g. the plan for a campaign, results of surveys and audits), and achievements. Announce environmental days etc. This will need only 5-8 minutes.

School Days: Every school has special functions to observe these days (Annual Day, Sports Day, Foundation Day, Independence Day, Republic Day etc.). Request the management to give some space and time for the Paryavaran Mitra activities to be showcased.

It would also be a good idea to observe these days with a focus on environmental themes. For example, the theme for an Annual Day could be Forests or Water. All items planned for the Annual Day may relate to different aspects of this theme. Some other themes for Annual Days can be Our City, Languages, Food diversity, Biodiversity etc.,

Competitions in School: All year round, there are numerous competitions conducted in the school–debates, elocution, poetry reading, essay writing, quizzes, drawing and painting. All these can have topics related to environment and personal action. These provide an opportunity for the participants and the audience to think about the many aspects of environment.

For example, the topic for a debate can be 'If a tree did not give us anything, should we still protect it'. 'Keeping public places clean is not our responsibility'.

Organizing theme-based quizzes (e.g. wildlife, water, our city) is much more interesting and fun, and will help in learning many aspects of a particular theme.

Bulletin Board: This is one place where students, parents and teachers get information and news. Request your principal for a dedicated notice board in a place in the school where everybody (visitors, parents, staff and students) can see. Use this board to share about Paryavaran Mitra activities, achievements, and announcements. For example, if there has been any newspaper coverage of Paryavaran Mitra activities, survey results, posters prepared by students to announce campaign, and events in the school. Display of creative work by the students on environmental themes can make this interesting and colourful, and give it special identity, to attract the whole school to the board.

Festivals: The whole school looks forward to festivals for the holidays that come with it. While the school may be having a holiday on most of the festival days, encourage the school to celebrate before the actual festival. Let your students take the lead in planning these celebrations in a way that the message of eco-friendly festival is conveyed. For example, all students in the school can take an oath not to burst crackers during Diwali. Use the festival occasion to reinforce our traditions of giving and sharing. Food, books, clothes are some things that the school can collect and give to the needy people on the occasion of Diwali, Christmas, Ramzaan and other festivals.

Cleaning up and decorating houses, visiting friends are traditions to linked to most festivals. It is important that these messages should be reinforced in the school so that children carry the messages to their home and community.

The school, the classroom and related learning sites are spaces where the core of educational activity takes place. These must become spaces where learners have experiences that help them achieve the desired curricular objectives.

NCF 2005

We tend to forget that most of our festivals are linked with seasons and agricultural cycles. Students can prepare posters, and drawings to put up on the bulletin board, and make presentations in the assembly to highlight these aspects.

Holi—One Festival, Many Ways to Celebrate

Safe colour campaign: Rallies and Campaign for no wood fires; Bulletin board–links to seasons; traditional foods, house decorations etc.; Assembly Songs and poems about holi.

Mela/Fairs: Melas and fairs are traditionally a part of our culture. Generally these are aimed at having fun. Organizing an educational mela with an environmental theme will blend both education and fun. For example, for their annual fair, the Anand Niketan School in Ahmedabad had the theme—Salaam e Heritage to celebrate the traditions, architecture, culture and natural heritage of Gujarat. They researched, and creatively displayed all these aspects through exhibits, performances, presentations, dresses and food.

Campaigns: Campaigns are an effective method of drawing attention of a larger audience. A campaign can include a mix of communication strategies—distribution of pamphlets and leaflets, talks, songs, skits, street theatre, rallies. Students can run a campaign within the school itself. For example Bijli Bachao or Pani Bachao campaign to save electricity and water respectively in the school. They can plan a campaign for the larger community as well.

School Days: Get the whole school to observe days like No Packaged Food Day, Healthy Food Day, Bicycle/Walking Day, My Favourite Bird Day. Flower Day. Such days make the time at school interesting and fun filled for the students.

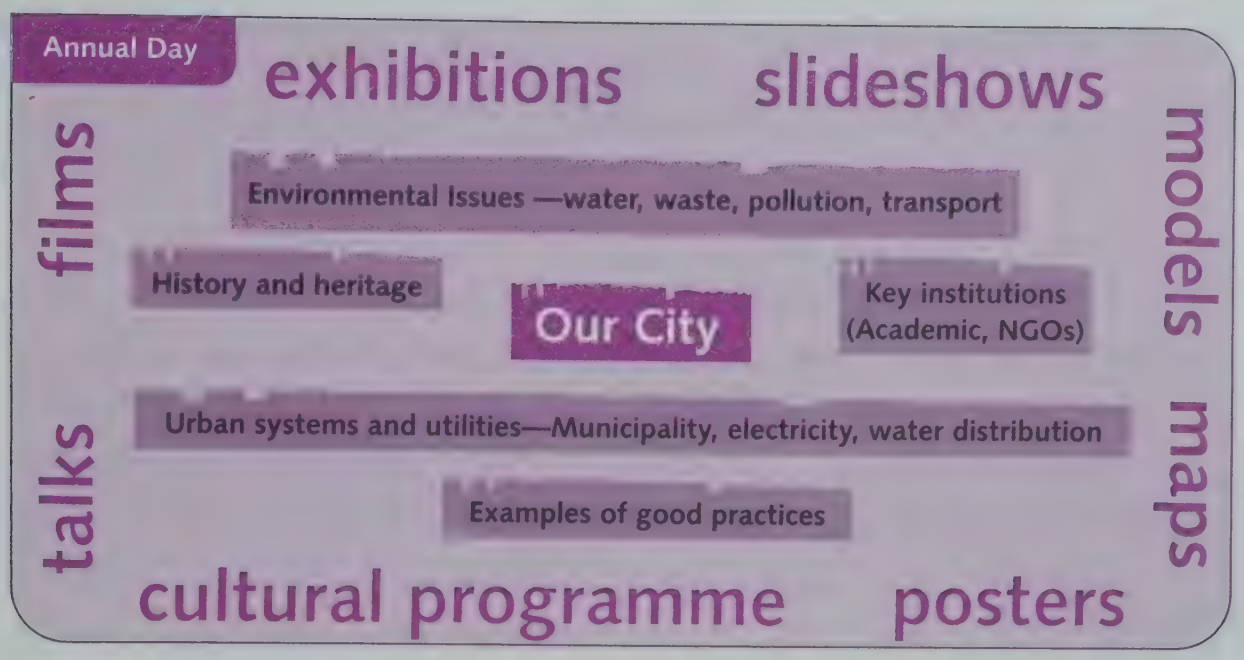
Setting the Example

The Paryavaran Mitra programme is a platform to learn positive environmental behaviour and address common concerns, issues, and related actions—both individual and collective. Thus, the best place to start communicating this message is by demonstrating this in every way.

Very often while planning for an event or programme we overlook small things may inadvertently communicate contradictory messages. For example, we may have a guest lecture on the issue of solid waste and serve tea in disposable plastic or thermocol cups! Every aspect of the school activity can be environment-friendly. It is important to be conscious of such aspects right from the planning of the activities and events.

Three rules of work: Out of clutter find simplicity. From discord find harmony. In the middle of difficulty, find opportunity.

Albert Einstein



Environmental Days are very good opportunities to organize a variety of activities and programmes related to that day.

March 21, World Water Day

Assembly: Why is the day observed, the theme for the day, facts and figures etc

Bulletin board: News items, water issues of the town/city, quotations

Competitions: Debate, quiz, essay writing, slogan writing

Film screening

Expert talk

Visit to facilities like water treatment plan, water pumping stations, traditional water harvesting and conservation sites.

Almost every month in the year has a designated **Environmental Day.**
The Environmental Day Calendar, with details, is given on the following pages.

Every individual matters. Every individual has a role to play. Every individual makes a difference. — *Jane Goodall*

Environmental Days Calendar

Environmental Days as Opportunities

The Government of India, United Nations Organizations, and other groups across the world have designated days on various themes related to the environment. These days achieve the important purpose of spreading awareness among people on various issues of a particular theme, be it water, biodiversity, environment, mountains, habitats, cultural diversity, wetlands, consumption, and so on. National days too provide an opportunity to instil the values of citizenship, which are integral to Paryavaran Mitra.

Observing these days as special events in the school provides an opportunity to reach out to the entire school community.

A special Day or Week is a good opportunity to plan and organize an "event' focussed around a particular theme.

As a Paryavaran Mitra teacher it is important to remember the following while organizing the events.

- Students should understand the significance of the Day---why the Day is observed.
- Review how the specific theme relates to your regional or local context, and how it can be best adapted to your context.
- Plan activities that serve the purpose of delivering the key message.
- Given the current worldwide concern with Climate Change, it is important to identify the links wherever possible with the issues of Climate Change and biodiversity.

It would be best to involve the students at all stages—from research and compilation of information, and locale-specific data, identifying the appropriate activities and planning the event.

In the case of many environmental days which have been designated by the UN and other international agencies, each year a specified theme is announced. This is usually put up on the relevant website a couple of months in advance. The URL for the related websites have been provided, to help you get more information and plan theme-based activities for different days.

The following pages present an annual calendar of some of the most commonly marked days. This is followed by a broad listing of possible activities that could be chosen. You can pick and choose a combination of activities that would be suitable. The calendar also includes some important national days.

January 12 — National Youth Day

This day is celebrated every year to mark the birthday of Swami Vivekananda, the great philosopher, thinker and patron of the youth.

The power of youth can be tremendous. Youth can play a leading role in practicing and promoting the value of National integration, spirit of communal harmony, brotherhood, courage and adventure. Young Paryavaran Mitra can be the Change Agents to lead the school, family and community in environmental action.

January 26 — Republic Day

On this day in 1950, the Constitution of India came into force and India declared itself a Sovereign Democratic Republic. Republic Day is celebrated in national capital, state capitals, municipal corporations, panchayats. Under the constitution of India, every Indian citizen has Fundamental Rights and Duties with reference to the Environment. Students should be aware of these and ensure that they are abided by.

February 2 — World Wetlands Day

World Wetlands Day is observed to mark the importance and values of wetlands. On this day in the year 1971 the Convention on Wetlands (Ramsar Convention) was signed, in the Iranian city of Ramsar, on the shores of the Caspian Sea.

The Ramsar Convention is an intergovernmental treaty which provides the framework for national action and international cooperation in protecting wetlands. It is aimed at raising public awareness of wetland values and benefits. India is a signatory to this Convention. There are 25 Ramsar sites in India.

Source: http://www.ramsar.org/key_cp_e.htm

February 28 — National Science Day

This day marks the discovery of Raman effect by C.V. Raman who won the Nobel Prize for this in 1930. Various activities are held to popularise the benefits of scientific knowledge and practical application. It is a time to highlight the role of science in the protection of the environment.

March 15 — World Consumer Rights Day

This day was first observed on 15 March 1983. Two years later, on 9 April 1985, the United Nations General Assembly adopted the UN Guidelines for Consumer Protection. The guidelines embrace the principles of eight consumer rights and provide a framework for strengthening consumer protection policies.

http://www.consumersinternational.org

March 21 — World Forestry Day

World Forestry Day aims to provide opportunities to learn and appreciate sustainable use of forests without actually destroying them. Even if we do not live around or close to forests, it is important to understand the value of green cover, no matter how small it may be.

March 22 — World Water Day

Water is vital for each and every aspect of life. In 1992 the United Nations General Assembly proclaimed 22 March of each year as the World Water Day with the goal to inspire action and encourage understanding of the need for more responsible water use and conservation.

March 23 — World Meteorological Day

The International Meteorological Organization was established in 1873. In 1950 a Convention created the World Meteorological Organization (WMO), as its successor. This Day is celebrated to mark the entry into force of this Convention in 1951.

Weather is an integral part of the environment. The WMO is a specialized agency of the United Nations for meteorology and promotes cooperation in the establishment of networks for making meteorological, climatological, hydrological and geophysical observations.

http://www.wmo.int/wmd

April 7 — World Health Day

Health is not merely the absence of disease or infirmity. The World Health Organization (WHO) defines health as a state of complete physical, mental and social well-being.

The objective of World Health Day, celebrated annually since 1950, is to raise global awareness of a specific health theme to highlight a priority area of concern for the world.

http://www.who.in

April 22 — Earth Day

On this day in 1970, a group of people in the United States of America got together and observed this Day to draw attention to increasing environmental problems caused by human activities. Since then, every year, events to mark the Earth Day are held all over the world.

http://www.earthday.net

May 22 — International Day for Biological Diversity

The United Nations has proclaimed May 22 as the International Day for Biological Diversity. This Day aims to increase understanding and awareness of biodiversity issues. On this Day in 1992, the text for the Convention on Biological Diversity (CBD) was adopted. 2011 to 2020 has been declared as the Decade of Biodiversity.

http://www.cbd.int/ibd

May 31 — World No Tobacco Day

Tobacco is the second major cause of death in the world. About 650 million people, that is, half the people that smoke today could eventually be killed by tobacco. Equally alarming is the fact that hundreds of thousands of people who have never smoked die each year from diseases caused by breathing second-hand tobacco smoke.

The member states of the World Health Organization (WHO) designated World No Tobacco Day in 1987 to draw global attention to the preventable deaths and diseases caused by tobacco. This Day is now observed annually to raise awareness of the global tobacco pandemic that kills millions of people each year.

http://www.who.int/tobacco

June 5 — World Environment Day

World Environment Day (WED) was established by the UN General Assembly in 1972 to mark the opening of the Stockholm Conference on the Human Environment.

WED is one of the principal vehicles through which worldwide awareness of the environment is created.

http://www.unep.org/wed

June 8 — World Oceans Day

This day is observed in honour of oceans which are the planet's most diverse and threatened ecosystem. This Day is used to create awareness about over fishing, pollution, and other threats to ocean life.

This is also an occasion to celebrate the oceans and their riches, to remind us of how essential they are for humanity's future, and to stress the responsibility of each of us and what we can do to keep our oceans healthy.

http://www.theoceanproject.org

July 11 — World Population Day

World Population Day was first observed in 1987 when the Earth's population reached 5 billion. In 1988, the Governing Council of the United Nations Population Fund (UNFPA) designated this day for annual observance and the UN authorized it as a vehicle for building awareness of population issues and their role in development and the environment.

http://www.unfpa.org/wpd

August 15 — Independence Day

On this day in 1947, India became independent from British rule. This national festival is celebrated with great enthusiasm all over the country, with flag hoisting ceremonies and cultural programmes.

The saffron colour in the national flag denotes renunciation. The white in the centre is light, the path of truth to guide our conduct. The green shows our relation to soil, our relation to the plant life on which all other life depends. The Ashoka Wheel in the centre is the wheel of the law of dharma.

September 5 — Teacher's Day

This day marks the birthday of Dr Sarvepalli Radhakrishnan who was great scholar, teacher and India's second President. A day to honour our teachers. The day is celebrated as a tribute to the contribution of teachers to society. Teachers mould the lives that they influence the lessons learned from teachers remain with students throughout their life. This is also a good day to recognize that every individual is at once a teacher as well as a learner.

September 16 — International Day for the Preservation of the Ozone Layer

The ozone layer, a fragile shield of gas, protects the earth from the harmful UV-B radiation of the sun. Exposure to too much UV radiation may lead to widespread damage to all life forms on earth. In 1994, the United Nations General Assembly proclaimed 16 September as the International Day for the Preservation of the Ozone Layer, commemorating the date of the signing, in 1987, of the Montreal Protocol on Substances that Deplete the Ozone Layer.

The Montreal Protocol prompts countries to phase out the production and consumption of ozone depleting chemicals. This international treaty has been signed by 191 countries including India.

http://www.ozone.unep.org and http://www.ozzyozone.org

September 28 — Green Consumer Day

This is a Day that reminds us that the consumer choices we make can have significant impact, either negative or positive, on the environment.

Every one of us is a consumer. We buy various products, ranging from daily necessities to luxury goods. As consumers we should be aware of our rights as well as our responsibilities. By saying 'no' to products that harm the environment, we can encourage production of goods that have a minimal harmful effect on the environment.

This is also a Day to remind ourselves and others that unless we as consumers do not demand for environmentally safe products, such products will not be made available. Ultimately it is consumers who decide what type of products are available in the market.

October 1-7 — Wildlife Week

To learn about wildlife and to expand awareness for wildlife and nature conservation the Indian Board of Wild Life that the first week of October would be marked as Wildlife Week.

October 2 — Gandhi Jayanti

The day is dedicated to the Father of the Nation, Mohandas Karamchand Gandhi. Gandhi's contribution towards bringing peace and non-violance is unparalleled. For Gandhi truth and non-

vilence were two inalienable virtues. The lessons of tolerance and respect for humanity are key to a sustainable society.

The day has been declared by the United Nations General Assembly as the International Day of Non-violence.

October 1st Monday — World Habitat Day

The United Nations has designated the first Monday of October every year as World Habitat Day to reflect on the state of human settlements and the basic right to adequate shelter for all. It is also intended to remind the world of its collective responsibility for the future of the human habitat.
http://www.unhabitat.org

October 16 — World Food Day

The Day marks the date of the founding of the Food and Agriculture Organization of the United Nations (FAO) in 1945. In 1980, the UN General Assembly endorsed observance of the Day in consideration of the fact that "food is a requisite for human survival and well-being and a fundamental human necessity."
http://www.un.org/food

November 14 — Children's Day

This day marks the birthday of India's first Prime Minister Pandit Jawaharlal Nehru. He was fondly known as Chacha Nehru. This day provides opportunity to sensitize children to become responsible human beings by including the less privileged. 20 November is celebrated as Universal Children's Day in other parts of the world.

December 2 — National Pollution Prevention Day

This day marks the anniversary of the Bhopal Disaster of 1984 that killed thousands of people in the Indian city of Bhopal in Madhya Pradesh, following the accidental release of Methyl Isocyanate (MIC) from a chemical plant located in the heart of the city. This event remains as one of the worst industrial disasters in history.

December 11 — International Mountain Day

The United Nations General Assembly has designated this day as International Mountain Day. This Day is an opportunity to create awareness about the importance of mountains to life; to highlight the opportunities and constraints in mountain development, and to build partnerships that will bring positive change to the world's mountains and highlands.
http://www.fao.org/mnts/intl

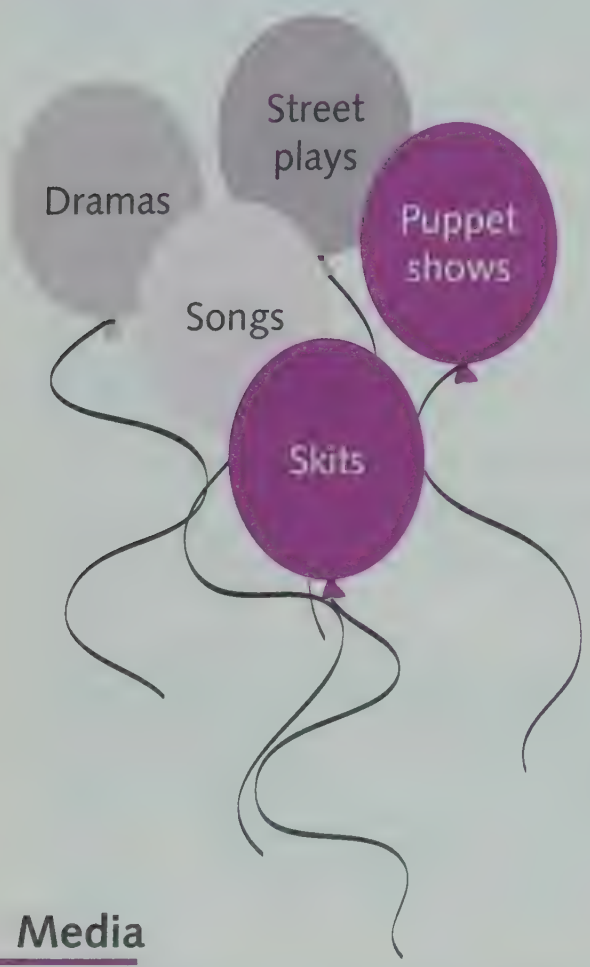
December 14 — National Energy Conservation Day

The Government of India has declared 14 December as National Energy Conservation Day. On this day everyone has an opportunity to do something for the betterment of the nation by conserving energy at home, at school, and at work.

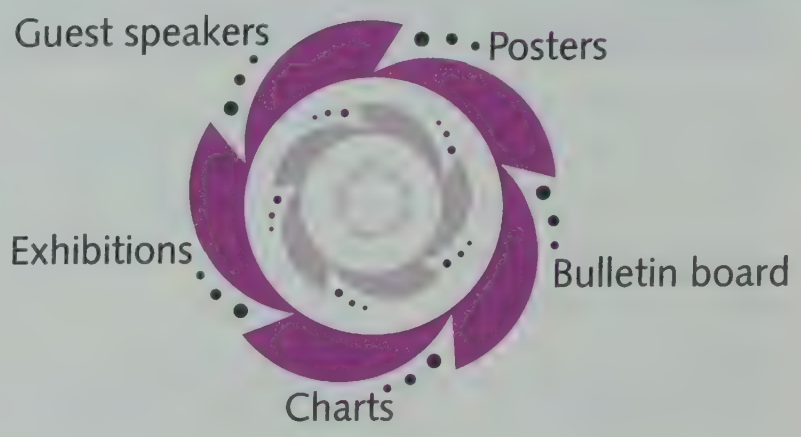
Activity Ideas for Celebrating Days

Given below is a menu of activity ideas which can be part of celebrating different Days. You can choose the ones which are best suited to the theme and the way you have planned the events For example a visit to a nearby wetland may be a good idea for Wetlands Day. A traditional food mela may be an interesting way to mark World Food Day. A Save Water campaign in school can be planned for World Water Day. All these can be supplemented with poster displays, exhibitions, assembly presentations, etc.

Creative Expression



Communication



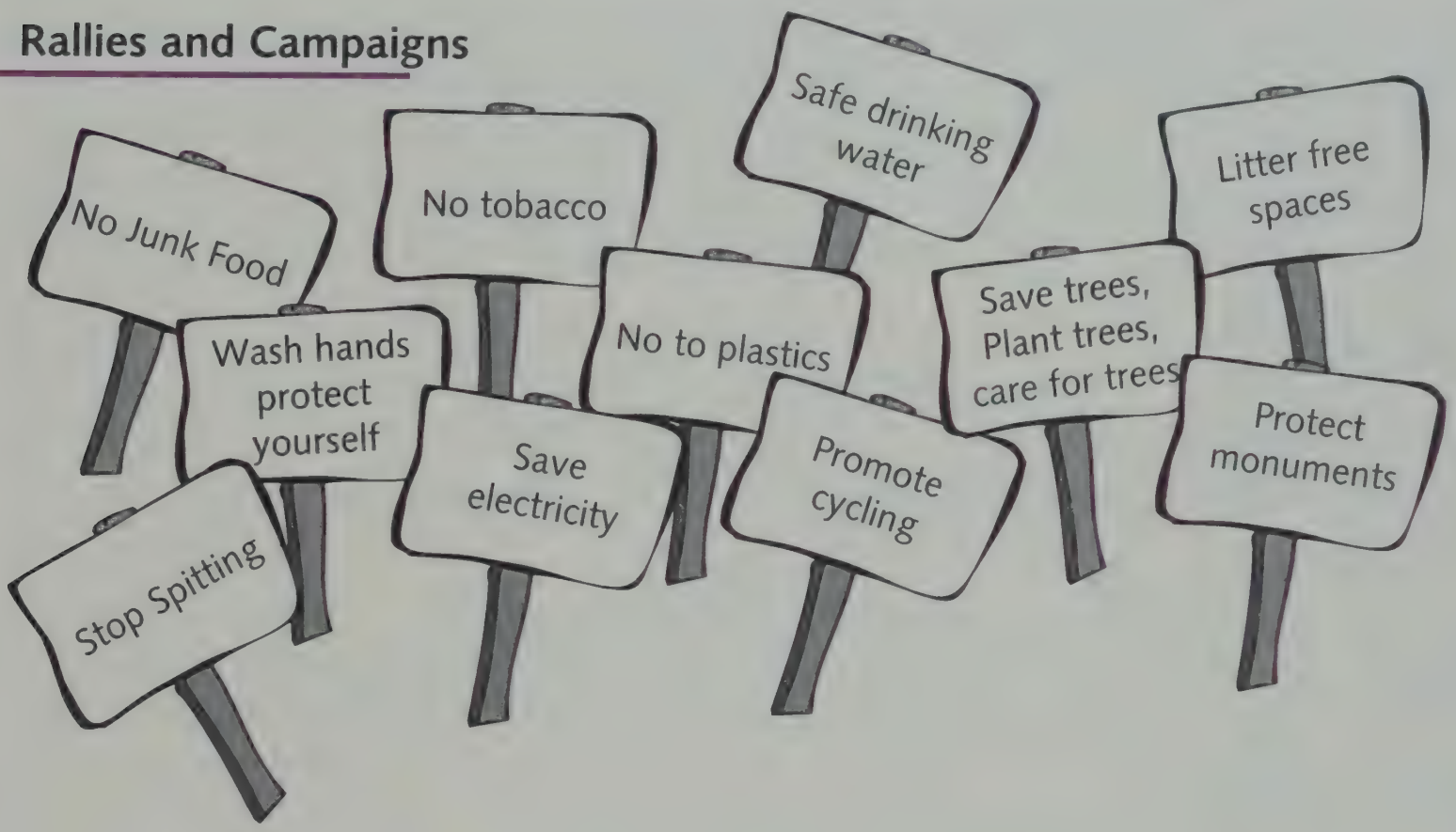
Media

Competitions

Visits

Visit a nearby natural site linked to the day wetland, ocean, forest, mountain (pond, lake, mangrove, salt marsh). Learn more about the flora and fauna of the site, threats to it, how people use it. Prepare a report.

Rallies and Campaigns



Cleaning

School

Neighbourhood

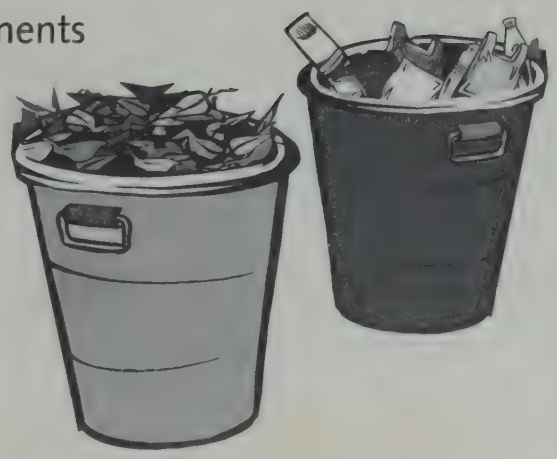
Nearby Monuments

Parks

Beach

Playgrounds

Market place



Greening

Plantation

How to be a Paryavaran Mitra School

Your students have found a way of segregating waste in the school. A compost pit has to be made for the wet waste.

You have planned the annual day function. Your principal reminds you that all the arrangements for the function must give an environmental message.

Your eco club has planned to set up a plant nursery in the school. They need guidance on how to do this.

The students have taken up a save water campaign in the school. They are looking for ideas on how to make interesting posters.

To become a Paryavaran Mitra school is to do more than activities and projects. A Paryavaran Mitra school is one which sets up systems and follows practices which demonstrate the commitment of the whole school community in taking and sustaining positive action for the environment.

The following pages provide a quick guidance on various things that would need to be done in the school towards becoming a Paryavaran Mitra school.

Follow the steps on How To...

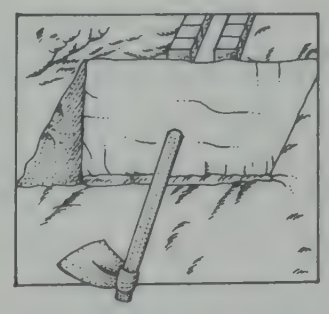
Build a Simple Soakage Pit

A soakage pit helps avoid water stagnation and also helps in water percolation. This is a pit filled with different sizes of stones or broken bricks, through which the waste water filters down and is soaked into the ground. Such pits may be built near a place where there are high chances of water wastage from nearby water pumps, drinking water or washing areas.

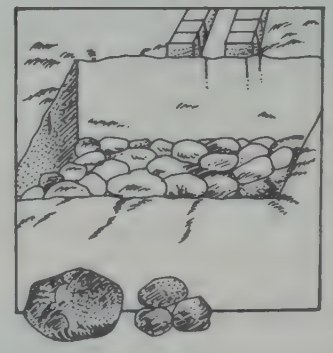
Soakage pit bricks may be acquired from construction sites. Students should get prior permission from those in-charge of the construction site. The stone fillings prevent the pit walls from collapsing. As the waste water flows into the pit, it gradually seeps into the ground.

Requirements: Stones of different sizes (~10-15 cm; 5-10 cm; and 1cm in diameter), a small pot (~20 cm in diameter), gunny bag, coconut fibres, etc.

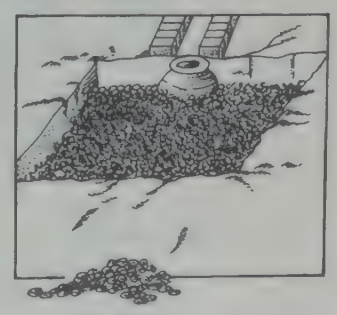
Steps:



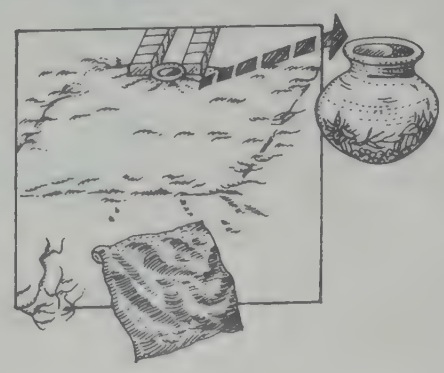
- make a channel from the place of water wastage to the place where the soakage pit is to be constructed.
- dig a pit of approximately 1m x 1m x 1m at the end of the channel.
- fill the pit up to one-third of its depth with large stones (approx.10-15 cm in diameter). This should be followed by smaller stones (approx. 5-10 cm in diameter) filled up to two-thirds depth.



- place a small (approx. 20 cm diameter) clay pot with small holes (approx. 2 cm in diameter), at the outlet of the channel. Coconut fibre/leaves can be placed inside the pot to trap the sediments. Then fill the pit with still smaller stones (approx. 1 cm in diameter) up to a level of 10 cm below the ground level.



- place a 5 cm layer of twigs followed by a gunny bag. Place soil on top of the gunny bag and compact it to ground level.
- the sediments in the pot should be removed regularly and fresh coconut fibre or leaves added.
- when the soakage pit gets clogged up (after a few years), it has to be emptied and the stones washed, dried and replaced.

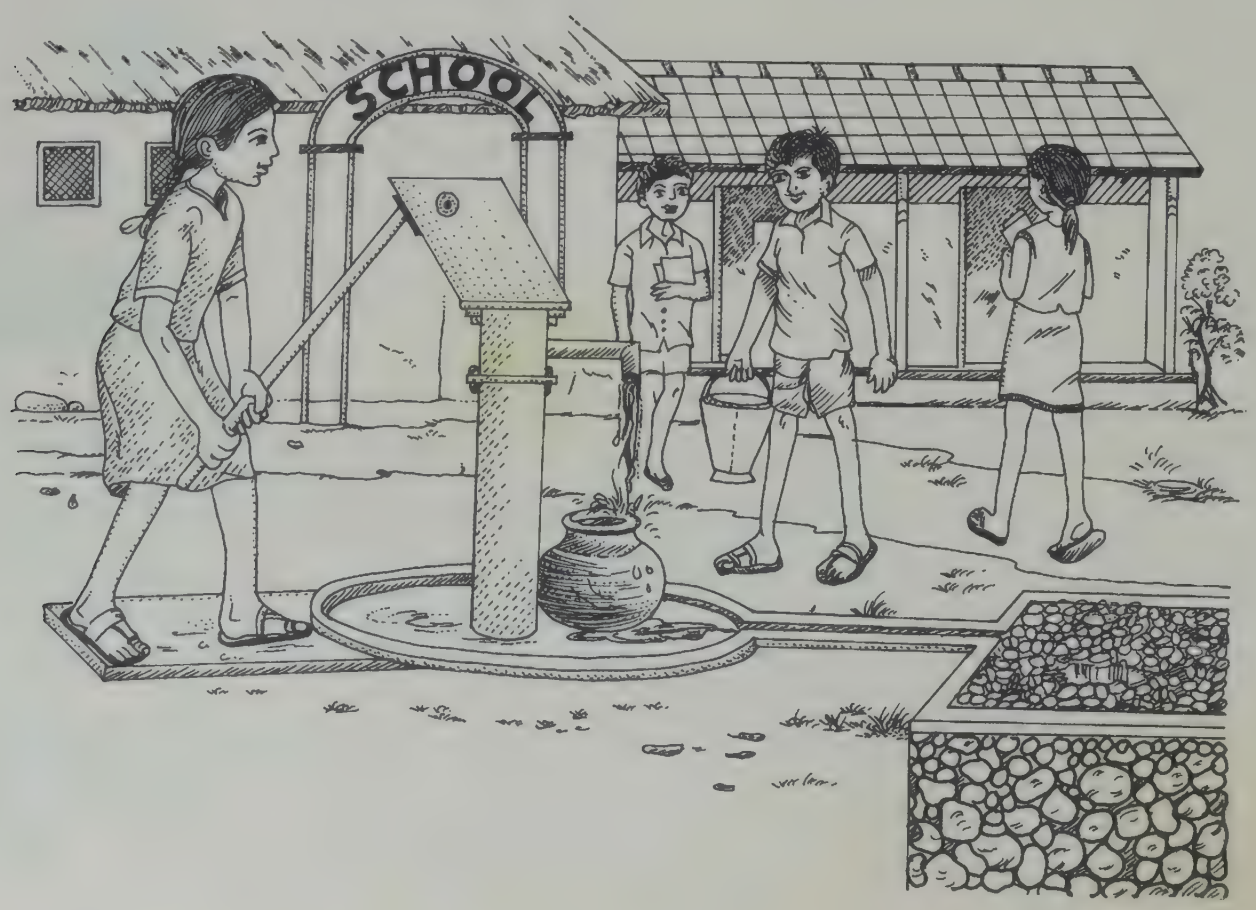


Source: "Let us Promote Sanitation"—UNICEF, New Delhi, 1988.

Deal with Stagnant Pools of Water

Stagnant pools of water can become a breeding ground for mosquitoes. The students may find places in the school or neighbourhood where there are stagnant pools of water. They could work with the community to prevent these from forming or deal with those which are present:

- If a large number of stagnant pools of water are found, especially immediately after the rains, one reason could be that the storm drains need to be cleaned. This could be done with the help of the local cleaners.
- Students could write to or approach the Municipal Corporation authorities, and request them to do the needful.
- They could also write to the newspapers about the conditions in the area.
- The areas near taps and hand pumps are also places where mosquitoes proliferate. Stagnation of water at such places can be prevented by diverting the water to nearby gardens, or planting flowering plants in the vicinity to make use of this waste water.
- If the water cannot be channelled and used otherwise, for example for watering plants, a stagnant pool of water can be filled with soil.
- They could also work with the community to encourage them to cement the immediate area around the hand pump/tap and then divert the water through small canals to the fields/gardens.



Make a Compost Pit

Organic matter constitutes 35 per cent to 40 per cent of the municipal solid waste generated in India. This waste can be recycled by the method of composting which is a natural process of decomposition of organic waste that yields manure or compost, which is very rich in nutrients. Composting is a biological process in which micro organisms, mainly fungi and bacteria, convert degradable organic waste into humus-like substance. This finished product, which looks like soil, is high in carbon and nitrogen and is an excellent medium for growing plants.

The process of composting ensures the waste that is produced in the kitchens is not carelessly thrown and left to rot. It recycles the nutrients and returns them to the soil. Apart from being clean, cheap and safe, composting can significantly reduce the amount of disposable garbage.

Steps:

- Choose a cool, shady corner in your school compound or garden where you can dig a pit. Generally, the dimensions of the pits are 6'x4'x3'. Although the length and the breadth of the pit may be altered, the depth of 3 feet is found to be convenient for aerobic composting, as it involves turning of the waste in the pits at fixed intervals.
- If there is money available, it is advisable to line the pits with granite or brick and cement. This will avoid the problems of rats and other burrowing pests from interfering with the system.
- The pit should be covered with a net or mesh to keep away flies and birds. The most important reason for lining the pits is to prevent nitrite pollution of the sub-soil water.

  Ask the students to collect organic matter (leaves, twigs, fruit peels, kitchen waste, leftover food, etc.) and put them into the pit everyday.
- Cover it with a thick layer of leaves (e.g. dried leaves swept off as garden litter). If dried leaves are not available, cover it with a thin layer of soil. This will prevent bad odour while allowing air to enter the pit.
- The waste needs to be turned once in three days to hasten the process of composting. The organic wastes collected each day can be put in the pits and covered with leaves or soil. At the end of 45 days, a pure, rich, organic compost is ready.

This compost manure could be used in the school garden. If the prepared compost is more than what is required for the school garden, then you may consider the option to sell it, either in the school itself (to the staff and other students who are willing to take it) or to any shop that is willing to market it.

Make Nest Boxes

With the reduction in trees and other vegetation, birds are losing their natural nesting sites. This also means that fewer birds are seen in cities and towns. Providing suitable nesting places can help to attract birds. This would also help the students to realize the efforts the birds make in nest building and thus sensitize them to the importance of not disturbing them at any time.

Selection of Site and Nest Type

Before initiating this programme, the students should observe the different kinds of birds found in the vicinity of the site, and find out more about each one, e.g. whether the bird is arboreal or terrestrial; how many eggs it usually lays; and in which season; what kind of nest it makes; what sort of materials are used by the birds to build nests, etc.

The nest boxes should take into account the sort of bird that is expected to utilize it. For example, if the box is intended for a sparrow, it should have roughly 25 cm x 25 cm x 25 cm dimensions, whereas if it is for a bigger bird like parakeet, it should be adequately bigger. They should also observe the size variations in the bird species which may use the nest box, as the nest they make should not* be too small for the normal size range of the birds.

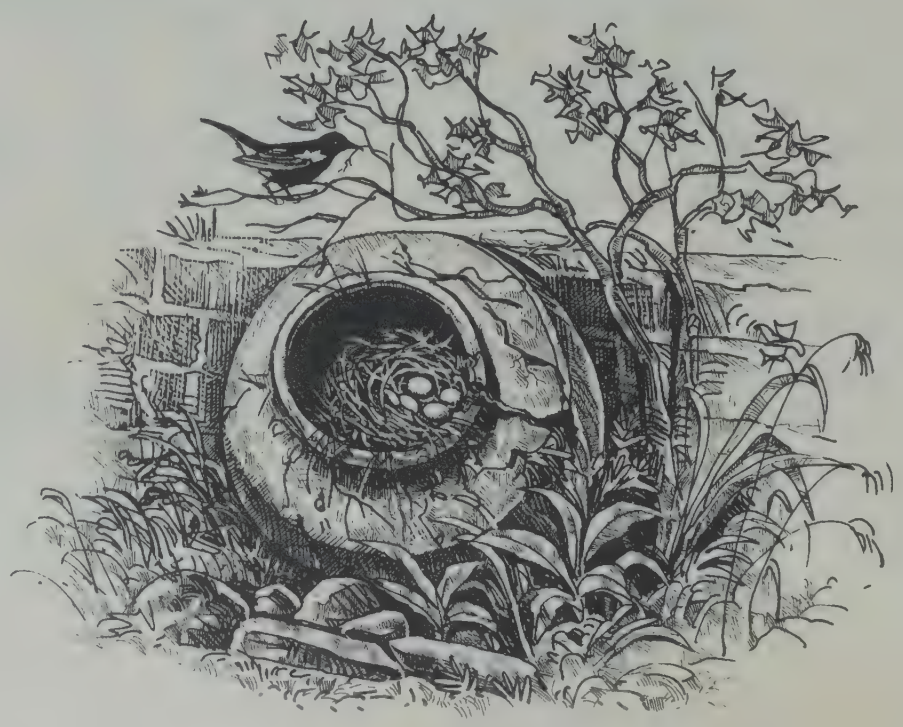
The nest box should be placed as near to the feeding and shelter sites, trees and shrubs, as possible. It should be positioned out of reach of strong sunlight, rain, wind and predators. Before positioning the nest box, the students should obtain permission from the concerned person, generally the owner of the site, building or tree.

Birds that build nests in holes are called cavity nesters. Some of these are Magpie robin, House sparrow, Common myna, Indian robin, Hoopoe, White-throated myna, Bank myna and Parakeets. Their nesting season is from February to mid August.

Earthen Pot

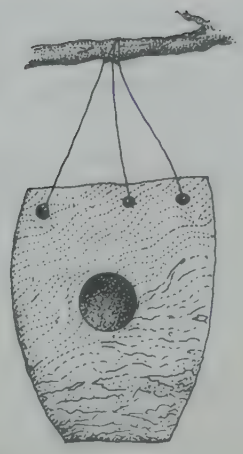
An earthen pot could be used to attract birds to nest. The size of the mouth of the pot can be adjusted by covering it. Or the mouth may be covered altogether and then a small hole made to allow only small birds like sparrows to come.

The earthen pot could be placed (hung) in one corner of the room near an open window or room. Or it can also be placed in a nearby tree, which can be observed from a window. A box with a small opening can also be used in a similar way.



Baked Mud Nest

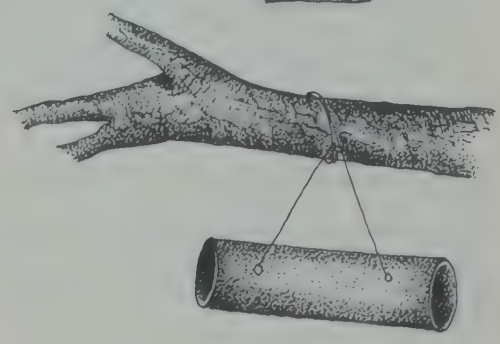
A container of baked mud can be used as a nest. Such a pot can be bought ready-made or ordered from a potter, depending on the size. This is cheap and can be used in all seasons and for several years. There should be small holes bored in the floor of the nest so that water does not remain in the nest. This nest can be hung on a tree or kept as shown. The length should be 21-25 cm. The entrance to the nest should be approximately 4-6 cm in diameter.



PVC Pipe Nest

A PVC pipe, about 14-21 cm in length and 4-6 cm in diameter can be used. One end of the pipe should be sealed. Holes should be made on the surface of the pipe for aeration. This could be fixed to a tree or hung from a branch.

This nest is best suited for Brahminy mynas.



Coconut-shell Nest

Coconut shells can be used to attract House sparrows to make a nest. Holes should be made on the sides of the shell and with the help of a string, it may be hung on to a branch.

A sparrow makes a cosy home in a cardboard box.

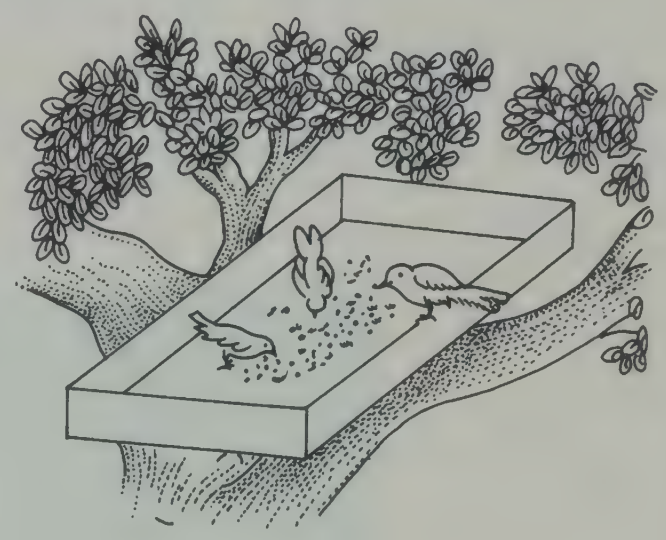
Make a Feeding Platform for Birds

Feeding platforms can help to provide food and water to some of the local bird population. For this the students should observe the common birds visiting the area and find out about their feeding habits. They can scatter different kinds of grains on the ground or window sill or any other suitable place where the birds can perch and feed. A bowl full of water can also be placed nearby and note the birds' behaviour to decide on the suitable type of platform and feed.

A feeding platform can be made in any open area which is not vulnerable to any predators, such as cats. It can be in the open stretch of ground in the school or in the balcony at home, or on the terrace.

To construct a feeding platform, fix a flat tray over a stand. This can be done placing a flat piece of thick cardboard or plywood over a stand—any tree stump already present can also be used, otherwise a stand can be made out of wood and the tray fixed to it with the help of nails.

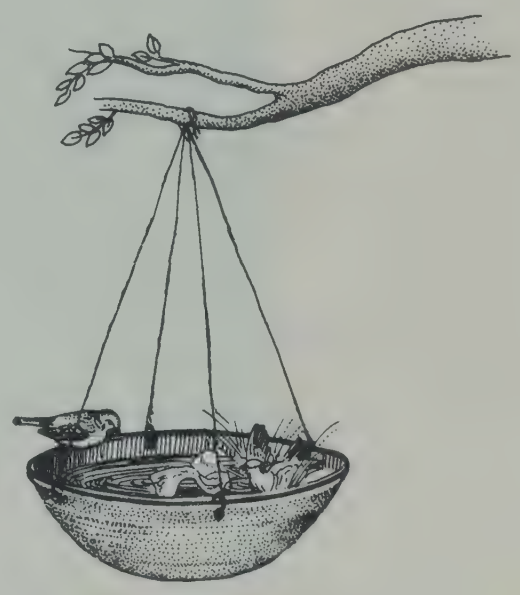
An old tin lid can be placed on the window ledge, or on a stand (like on a tree stump) and grains placed in it. Half of a used coconut-shell can be hung from a branch, with grains in it.



Grains of jowar, bajra, rice etc. can be used as feed. Soaked ground nuts, with shells, which are strung and hung near the window will also attract birds.

A quiet spot with relatively clear ground can also become a place where grain is regularly scattered. Gradually birds and squirrels will come to the spot, and become regular visitors.

Water can also be provided near to the feeding areas. Shallow earthen pots or water pots with their top broken can be used to keep water for these. Avoid using vessels made of lead or copper for this purpose as they are poisonous.



The water should be replenished regularly and the container kept clean. The feed scattered should not be contaminated with chemicals and should not be rotting as it will affect the health of the animals which feed on it.

The students can, at the end of the project, share their findings with other students and teachers in the school.

Create a Plant Nursery

Students could be encouraged to start a nursery. Nursery raising can be an important activity in places where there is a shortage of space. Sale of saplings could also generate income.

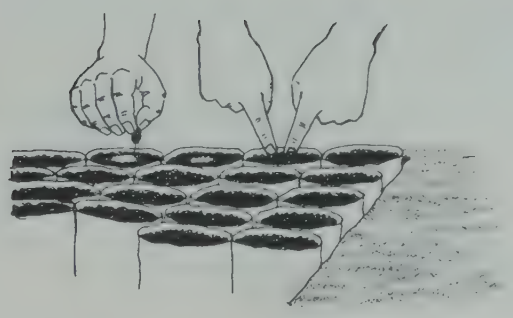
Seeds of local trees like neem, pongamia, gulmohur, copperpod, rain tree, etc., are to be collected during the appropriate season.

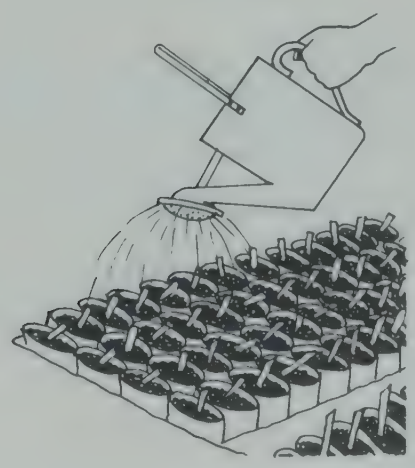
Seeds which have a thick coat need to be soaked in water overnight before planting. Seeds like that of cassia need to be activated by placing them in hot water for about three minutes.

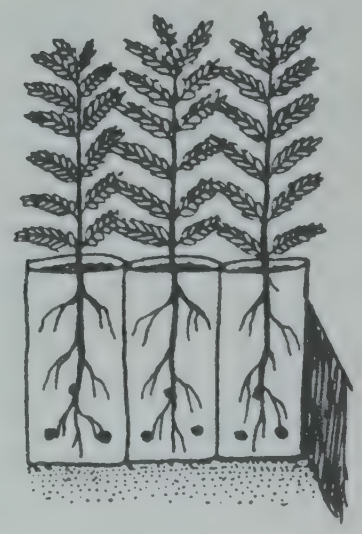
Seedlings should be sown in plastic bags, of about 20-30 cm in length and 10 cm in diameter, which may be purchased or collected.

To sow the seeds

- Mix equal proportions of red earth, manure, garden soil and sand, from which larger stones have been removed.
- Fill three-fourths of the plastic bag with this mixture.
- Place one or two seeds in each bag, inserted to a depth which equals the size of the seed.
- Keep the bags in a shady place away from direct sunlight.
- Sprinkle with water regularly to keep the soil moist, preferably in the mornings and evenings.
- Wait for the tiny seedlings to sprout. Weeds should be removed as and when they appear.







Plan a Plantation Programme

Understanding the Environmental Conditions

Different plants have different climatic as well as soil and water requirements for optimal growth, so it is important to understand the climatic conditions of your region before deciding on the plants to be grown.

What are the temperature ranges in different seasons?

What are the soil characteristics (sandy, clay, acidic, etc)?

What is the water availability?

Species Selection

The selection of species to be grown in the area again depends on the specific climatic conditions. As far as possible, plants which grow locally should be chosen.

It is possible to get some idea about common local plant species by conducting a survey in the neighbourhood, visiting a nearby nursery, garden or seed centre, or talking to knowledgeable individuals who have lived in the area for a long time. From this, a list of local plants: trees, vegetables, flowering plants, medicinal plants, and those that can be grown for fodder, could be formulated. This can serve as a menu for selecting plants for specific conditions for your programme.

If a vegetable garden is planned, then seasonal vegetables may be grown. Sword bean, capsicum, cucumber, french bean, ladies finger, bottle gourd, brinjal, maize, etc., are some summer vegetables. Carrot, radish, turnip, cabbage, cauliflower, peas, beans, tomatoes, etc., can be grown in winter.

Some Plants You Can Plant

Mulberry *(Morus alba)*	Jamun *(Eugenia jambolana)*	Dhak *(Butea monosperma)*
Gulmohar *(Delonix regia)*	Custard apple *(Annona squamosa)*	Ber *(Zizypus sp.)*
Tamarind *(Tamarindus indicus)*	Peepal *(Ficus religiosa)*	Drumstick *(Moringa oleifera)*
Kachnar *(Bauhinia variegata)*	Siris *(Albizia lebbeck)*	Babul *(Acacia nilotica)*
Poplar *(Populus ciliates)*	Semul *(Bombax ceiba)*	Mango *(Mangifera indica)*
Arjuna *(Terminalia arjuna)*	Citrus species	

Schools that have limited space may grow creepers, which could cover the school compound walls.

Money plant *(Pothos sp.)*	Jasmine *(Jasminum sp.)*	Morning glory *(Ipomea sp.)*
Trumpet vine *(Tecoma sp.)*	Asparagus *(Asparagus officinalis)*	
Railway creeper *(Campanula sp.)*	Golden flower *(Bignonia sp.)*	Tube flower *(Clerodendron sp.)*

Prepare a Plot for Planting

Preparation of Soil: This should be done preferably four to six weeks before sowing or planting.

For tree planting, only the area immediately surrounding the actual site of planting needs to be prepared.

For other plantations, preferably the entire area should be prepared.

For potted plants, well-mixed soil should be used.

In the case of nursery raising, polythene bags should be filled with well-mixed soil along with manure.

Soil preparation begins with clearing the site of thorns, weeds, stones, etc. Then the soil is dug and turned up, in order to mix the topsoil and subsoil with nutrients, aerate the soil, kill unwanted microbes, and break up clumps.

A shovel is required for soil preparation. The school gardener may have one and he may be asked to teach the students to use the same.

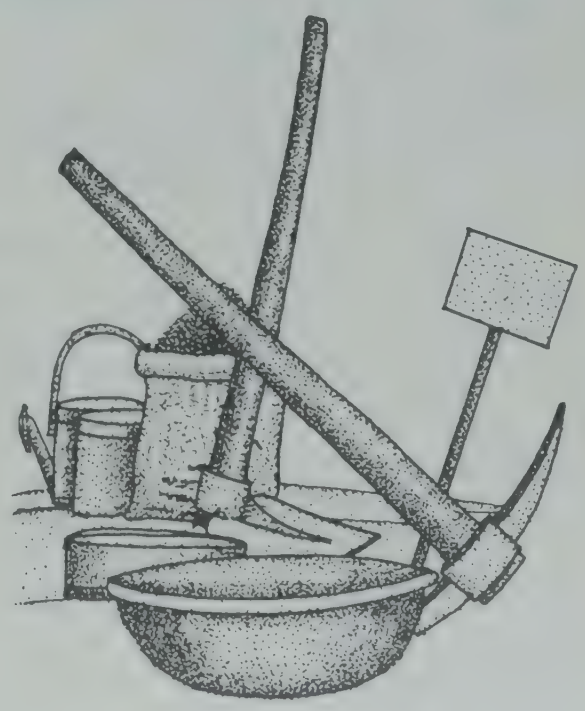
A simple way to prepare the soil

- Remove the topsoil and set it aside.
- Remove the subsoil and keep it separate.
- Return the topsoil into the pit first, and then top it with the subsoil.

After this, compost manure should be added and forked into the soil using either a fork (if available) or any easy-to-handle metal rod. The surface should be levelled, using the back of the shovel if the area is small. If it is large, a bamboo pole may be rolled and gently patted over the soil. Then the soil should be watered.

If the plantation activity is to commence with the beginning of the school year, soil preparation could be done prior to the summer vacations or immediately after school reopens.

Further soil preparation depends on the type of planting that has been planned.



Prepare for Tree Plantation

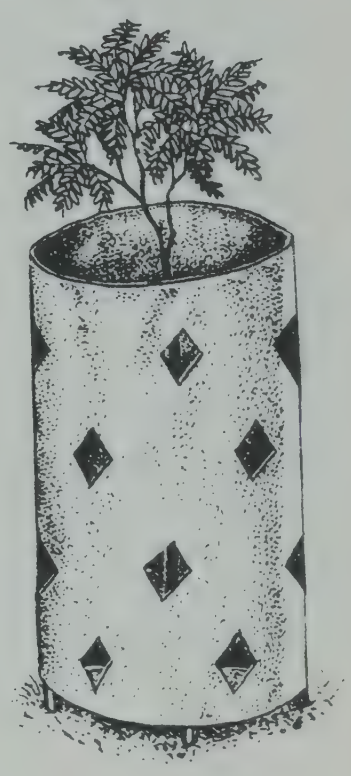
Tree planting should be done prior to the rainy season, once you have planned and prepare the area/soil for plantation.

While planting, the following points should be kept in mind:

- Trees should be planted at a distance of at least eight metres from buildings.
- When planting more than one tree, usually a distance of at least one tree length, in other words the height the tree is expected to attain at maturity, is to be maintained between two trees. This could be determined either by observing other full-grown trees of the same species in the locality, referring to a book, or asking local gardeners.
- Gardens should not be placed under the shade of tall buildings or trees.
- If a large area is to be planted, preferably it should be laid out in small beds of nine m^2, with small irrigation channels. This makes it is easier to tend the beds without trampling over the plants, and to drain off the excess water.

Obtain saplings from the neighbourhood nurseries. Forest Department
Nurseries also supply saplings, usually free of cost.

- Dig a pit 120 cm x 120 cm x 120 cm.
- Carefully place the sapling in the pit. The tap root should be upright in the pit.
- Before filling, part of the pit (preferably one-third) should be first filled with compost manure. Then the soil should be put in and pressed down tightly.
- Young trees need a large amount of water once a week, rather than frequent surface sprinklings.
- Saplings would be sufficiently protected with tree guards, rather than fencing off the entire area as required for a garden.



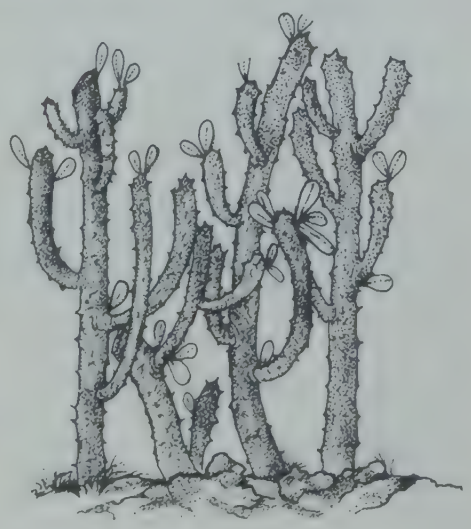
One of the most popular tree guards is a used coal-tar drum with the base and top removed, and with big holes cut on the drum's surface. Tree guards should be at least 0.6 m x 0.6 m, or approximately 2 m in diameter, if a round guard is used, with a height of 2.25 m.

Thorny twigs may also be placed around saplings to prevent grazing, but these are less effective. Thin bamboo poles surrounded with mesh is another option.

Protect and Maintain Plants

For the saplings to survive and grow into healthy plants, they need to be protected from being uprooted, trampled or eaten by animals. This can be done in several ways.

After obtaining the necessary permissions, a fence should be erected around the plantation site. An initial mechanical fence could be used along the boundaries of the sites. This could be made out of wooden stilts or bamboo poles and barbed wire, which is stretched and twisted across and around each pole. The distance between the wire lines should be such as to prevent grazing animals or dogs from entering the site. Fast- growing hedge plants such as henna, agave, or thorny cactus, planted in the month of March-April, would reach a sufficient size by the end of the rainy season to provide protection. This line fencing is effective and easy to maintain.



Maintenance

Once plantation has been carried out, the following activities should be carried out on a regular basis. Groups of students can be assigned specific tasks along with the schedule.

Watering	
Trees	Copious watering once a week.
Grasses	Watering frequently enough so that the area does not dry up.
Vegetable garden	Regular watering once every three to four days including wetting of the leaves.
Flower garden	sprinklers may be used to avoid water logging.

Weed Control

Weeds are unwanted plants that utilize the water and nutrients in the soil, thereby affecting the growth of other plants. These should be regularly removed either by hand or using simple implements.

Application of Nutrients

Some of the nutrients which support efficient plant growth may be lacking or in insufficient quantities in the soil, and may be supplied through addition of fertilizers.

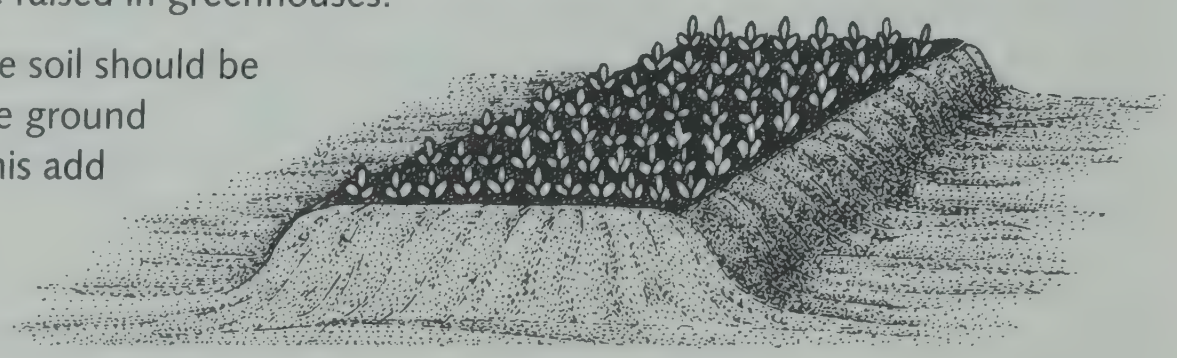
Compost manure is beneficial for all plants. Other materials that may be used as manure are cow, horse, sheep and goat dung, leaf mould, green manure, oil cake, night soil and chemicai fertilizers. Always mix the manure with soil first before applying to the plant.

Make a Vegetable Garden

An area intended for vegetable gardening should be fully exposed to the sky and sunlight, and as far away from trees as possible. The area should be protected from hot and cold winds by a fence or a hedge. The nursery should be located in an area which does not receive too much hot sun, and would not be flooded by heavy rains. This could be achieved by digging drainage canals around the area to drain rain water quickly.

In areas with extreme temperatures, either too cold or too hot, for saplings to survive outdoors, nurseries may also be raised in greenhouses.

Mix the topsoil and subsoil—the soil should be dug and turned up and then the ground should be levelled. On top of this add a layer, of about ten cm, of farmyard manure or compost manure.



In case of vegetable crops like tomato, brinjal, chilli, cabbage, cauliflower, onion, etc., it is desirable to sow seeds in well-prepared, raised nursery beds 60 - 70 cm wide. Seeds should be sown thinly in lines 5 cm apart at a depth of 1 - 1.5 cm.

Nursery beds should be watered with a fine sprinkler after sowing, avoiding flooding at all times.

Tomatoes, brinjal and ladies finger should be sown on plots with ridges and furrows. The seeds should be sown in ridges and irrigated in the furrows. The ridges should be 0.6 m apart and should preferably run in a North-South direction.

Mustard can be sown by broadcasting. Carrot can also be sown by evenly spreading the seeds on the plot. Later thinning (to reduce the crowding of plants) needs to be done.

Peas and beans should be sown in rows with a distance of 0.3 m—0.6 m in between. These plants may need support as they grow, which may be provided in the form of bamboo stilts.

Watering should be done at least once every four days.

The vegetables may be either distributed among the students and other staff involved in maintaining the garden, or sold and the money used to purchase tools and implements, seeds, etc. necessary for gardening.

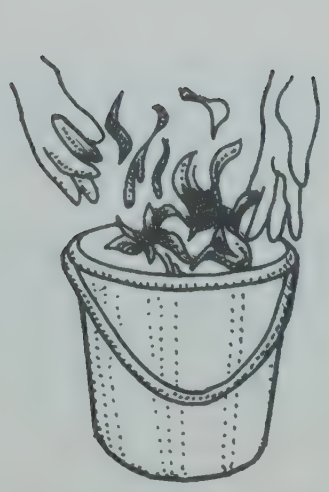
Make Recycled Paper

Waste paper from old notebooks, used, unwanted office stationary, old newspapers, etc., could all be used to prepare recycled paper. Students could collect used paper from different classes, school offices, library, etc., as well to use paper that would have accumulated in the dustbins during the collection and segregation step. Paper bags, wrappings, paper notices, etc. may also be collected from home.

Requirements: Waste paper (old newspaper, waste paper from school and offices, paper that comes with packages, etc.), very fine wire (or plastic) mesh, absorbent cloth (old towels), large plastic buckets or bowls or basins, wooden spoon, colour (optional, to give colour to the paper), plastic bags, weights, etc.

Steps:

- Shred the paper into small pieces and put in a bucket of water.
- Let it soak overnight.
- Drain off excess water and using the wooden spoon, mash the paper into pulp.
- Cut the mesh to the size of paper required.
- Put the pulp in a basin (the basin should be able to accommodate the mesh) and add equal volume of water and mix well. (Increasing or decreasing the amount of water will affect the thickness of recycled paper. For example, if there is more water in the pulp, then it will spread more easily and the paper will be thinner.)
- Slide the mesh into the basin and move it around in the basin until it is evenly covered with pulp. Lift out the mesh which is now covered with a layer of pulp.
- Place the mesh over an empty basin for at least one minute so that the excess water in the pulp drips off.
- Place the mesh with the pulp side up on a towel or blotter which is placed on some old newspapers.
- Place another towel or blotter over the pulp and cover it with another old newspaper.
- Roll a rolling pin over the sandwiched pulp to squeeze out as much water as possible.
- Remove the top newspaper and then turn the blotter-sandwich over, so that the mesh is on top.
- Remove the blotter and mesh very carefully (a butter knife may help). The pulp should not be disturbed.
- Allow the pulp to dry for a day or two.
- When the recycled paper is dry, neatly trim the edges.



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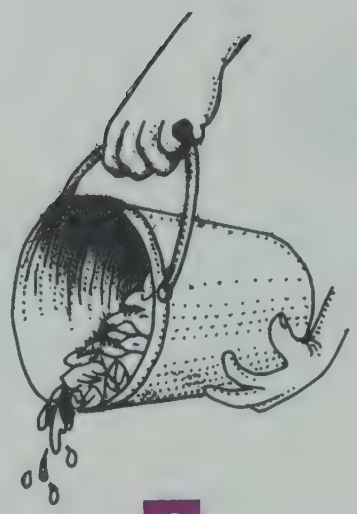

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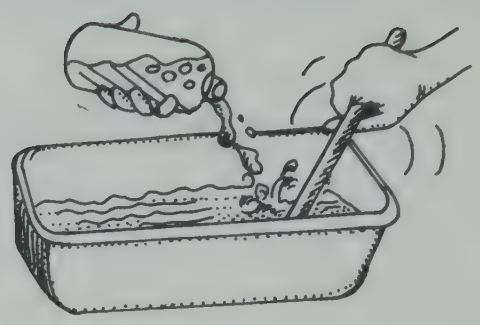

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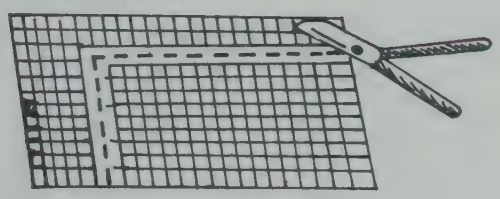

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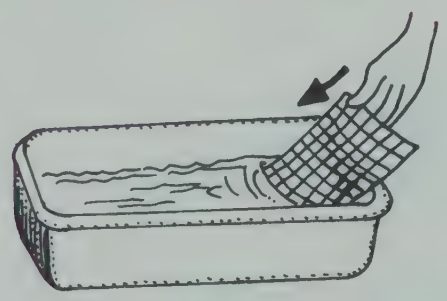

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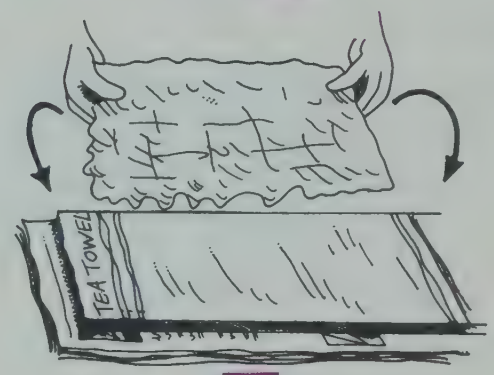

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Pretty Paper!

Leaves may be placed on the last layer of the newspaper that is placed over the pulp to make patterns on the paper. Coloured paper is made by adding liquid dye made from plant materials such as bark, fruits, petals, etc., while mashing the paper into pulp. Scented paper is made by adding a small amount of perfume or natural scents (lavender, mint, etc.).

Re-use Plastics

Plastics are difficult to recycle, as this process involves high temperatures and may emit gases which could be harmful if proper precautions are not taken. Even then, it is only possible for plastics of a similar kind to be recycled together. It is recommended that the students re-use the collected plastics. Different kinds of plastics could be segregated and sold to the *kabadiwallah* as well. Some of the plastics which are used in day-to-day life could easily be reused.

Here are some ideas to get the students started:

- Thick polythene, as used in milk pouches, could be made into bigger bags. Slit milk bags on two sides to make a sheet of polythene. Wash the bags with warm water and detergent. Stitch these sheets together to make bags with handles. The stitching can be done with a sewing machine if available, or needle and thread, although this may not be as sturdy as machine stitching. Such sheets may also be used for covering books, to make large covers to protect school bags from rain, etc.

- Thinner polythene bags could be shredded and used to fill rag dolls, if such an activity is carried out in the craft classes.
- Thicker and larger polythene could be stitched together and used to cover things kept outside (implements, cycle, etc.)

Make a Solar Cooker

A solar cooker helps to reduce the use of conventional fuel. It does not pollute the environment. The slow cooking process preserves the nutritional value of food.

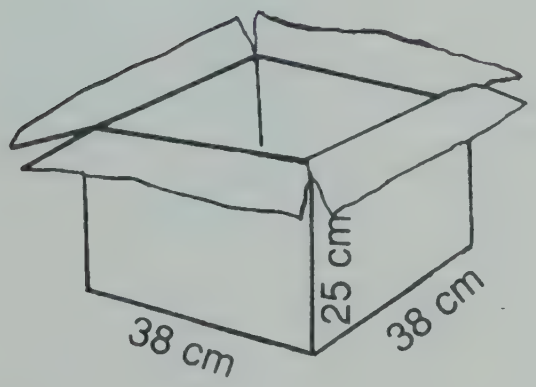
Students can build a working model of solar cooker according to the instructions given.

This model of solar cooker is based on having one box inside the other. The larger box of dimensions 38 cm x 38 cm x 25 cm will serve as the outer box, and the box of dimensions 31cm x 31cm x 22 cm will serve as the inner box.

Steps for making the solar cooker:

- Paste silver foil on all the inside surfaces of the larger box.
- Also paste foil on the inside and outside of the flaps (lid) of the outer box.
- Paste black paper on the bottom of the inner box. On all the other inner surfaces of this box, paste silver foil.
- Cut off the flaps of the inner box.
- Make four 'legs' for the inner box by folding four pieces of corrugated sheet and pasting near the four corners at the bottom of the box. The height of the legs should be about 3 cm.
- Place the smaller box inside the larger one. If the height of the inner box is more than that of the outer box, trim as necessary to bring them to the same height.
- Fold the flaps of the outer box such that they cover the gap between the outer and inner boxes and can be folded down 2 cm into the inner box.
- Hold tight and tape down securely, so that there is no gap. If there is extra length, trim it.
- Now, cut a piece of corrugated sheet (approx. 42 cm x 42 cm) large enough to make a tight fitting lid for the outer box (38 cm x 38 cm).
- Cut out a window of the size of the inner box (31 cm x 31 cm) from this piece of the sheet. Tightly tape a piece of thick transparent plastic over this window.
- Paste silver foil on the inside of the lid (except where there is plastic).
- Now fold and tape the edges of the corrugated sheet to make a tight fitting lid.
- Take a piece of cardboard of 43 cm x 43 cm size to make a reflector. Paste silver foil on the inside.

- Make hinges of cardboard and attach with flower clips to the lid and the reflector.
- Take a piece of cardboard of 15 cm x 12 cm and make serrations as shown in the illustration.
- Tape securely, at the angle shown, to the outside of the box.
- Make a firm prop using a folded piece of cardboard or a stick. The prop should be long enough to hold up the reflector at 90°. The solar cooker is ready to use.
- Cook kichchdi. Take rice and moong dal in 2:1 ratio, wash them clean, add five measures of water). Put these in an aluminium container with a lid, painted black on the outside. Place the container in the inner box and cover tightly.
- Set up the solar cooker where there would be no obstruction of sunlight through out the day. You may have to turn the cooker to allow continuous stream of sunlight while cooking.



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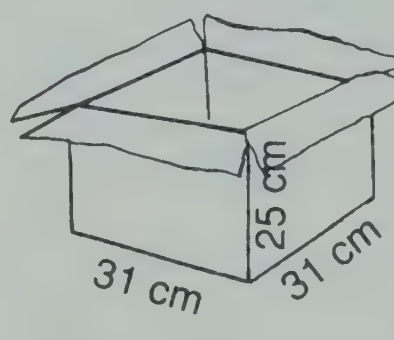

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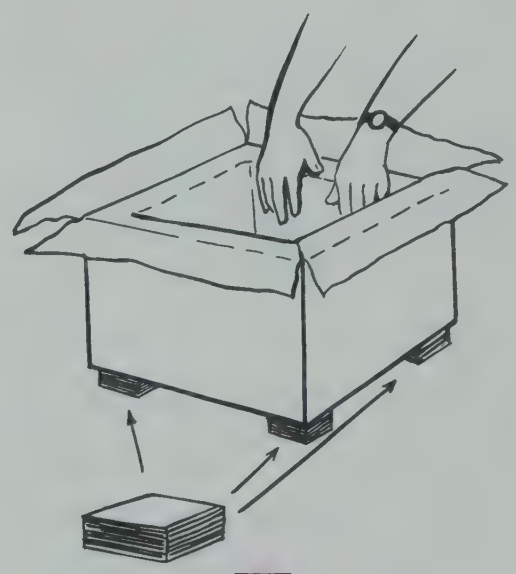

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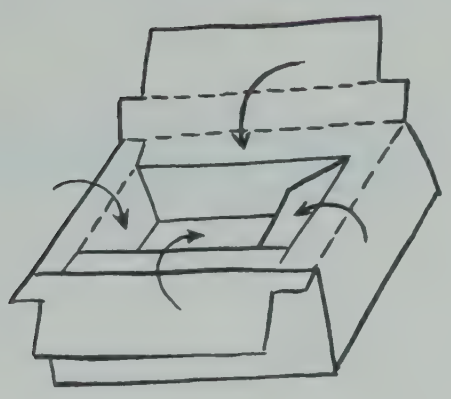

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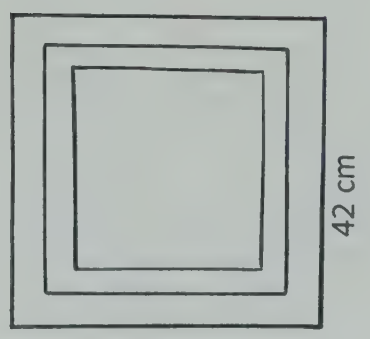

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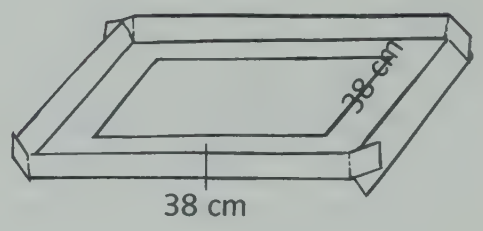

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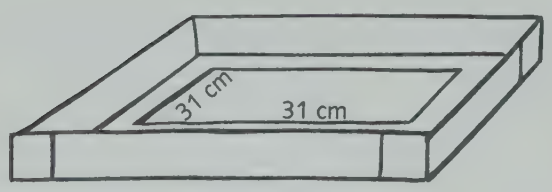

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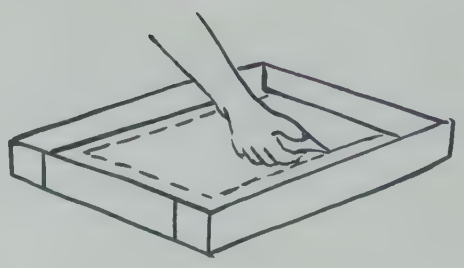

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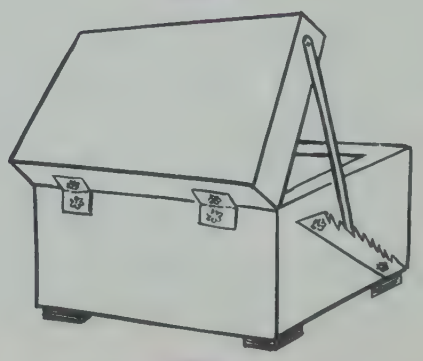

9

Detect Adulteration in Foodstuffs

Adulteration of foodstuff may occur at any stage of the chain, from production to selling of the food—i.e. growth, harvesting, storage, processing, transportation and distribution.

Adulteration could be incidental or intentional. Incidental adulteration occurs due to ignorance, negligence or lack of proper facilities for processing, storing or transporting material. Intentional adulteration includes the intentional addition, subtraction or addition of substances, which adversely affect the nature, substance and quality of food. In either case, quality of food is lowered and there may be adverse impacts on health.

As consumers students need to be aware of this, and also learn how to detect some common types of food adulteration. The findings can be used to plan and carry out campaigns for consumer awareness.

Simple Tests and Observations

Chilli Powder

Sprinkle the powder on the surface of a glass of water. If wood shavings float on the surface and water turns red, it shows adulteration with saw dust and artificial colours.

Cinnamon

Add cinnamon powder to water and stir. If it dissolves in water, it shows the presence of cassia bark, which resembles cinnamon in taste and colour.

Black Pepper

Soak the pepper in water. If adulterated with papaya seeds, these will float to the surface of water.

Asafoetida

Dissolve the contents in water. The powder should dissolve and form a milky solution. If it does not dissolve, it reveals adulteration with resin or gum.

Pulses (Bengal gram/ Red gram)

To the pulses, add five ml of water and a few drops of hydrochloric acid. If the colour turns pink, it reveals adulteration with Kesari dal (Lathyrus sativa) that has been artificially coloured yellow with coal tar dye metanil yellow.

Tea leaves

Moisten tea leaves and place on blotting paper. If spots of yellow, pink and red colour appear, it indicates adulteration with used tea leaves that have been artificially coloured.

Coffee

Add a small quantity of filter-coffee powder (not the instant coffee powder) to cold water and shake well and let the entire set-up remain undisturbed. If chicory has been added, it will sink to the bottom and stain the water into a brownish red colour.

Butter and Ghee

Take equal quantities of butter or ghee, and hydrochloric acid. Add 2-3 drops of furfural solution to the mixture. Shake well and let it stand for a few minutes. The appearance of pink colour at the bottom of the acid layer shows adulteration with vanaspati.

Heat vegetable oil with nitric acid. Appearance of red colour implies that Argemone oil has been added.

Milk and Milk Products

Use a lactometer to measure specific gravity. It should range between 1.020 and 1.034. If the specific gravity is not within this range, it indicates adulteration with water.

Add a drop of iodine to a little milk. If it turns blue or grey, it shows addition of starch to thicken milk.

Packages and Labels

It is important to also study packaged food items to check for ingredients and other details. These details are essential labelling requirements as covered by Prevention of Food Adulteration Act (PFA), 1954. Ask students to collect some packaged food items, observe the package carefully and note

- Does the packaged food bear the name and complete address of the manufacturer, packer, vendor and importer?
- Does it give the name and trade name of the product?
- Are the ingredients listed in descending order of composition?
- Does the information on the packing give net weight or volume, distinctive batch number or lot number?
- Do the date, month and year of packaging appear in capital letters and does it come with 'Best before use'.
- If the product is irradiated, does it come with proper labeling that it is irradiated food? Are the prescribed doses of radiation mentioned?
- Is there extraneous colouring matter natural or synthetic that is added and is it displayed in capital letters just beneath the ingredients on the label?
- Does it display maximum retail price?

Organize a Mela

Events like melas, fairs, etc. have been organized in our country for centuries. Generally, these fairs are aimed at fun and enjoyment. Many are associated with festivals and there are some that are trading events like the famous Sonepur Mela in Bihar, which is a cattle fair. Modern fairs have a different look, and are often guided by more commercial considerations.

There are also educational melas that are generally a blend of both education and fun. Education coupled with fun has been seen to be very effective in communicating messages. Your students can arrange such a mela to spread the messages of Paryavaran Mitra and conservation action.

Games, plays, quizzes, competitions and posters relating to the themes can mark the ocassion and help communicate the message effectively to other students and the community.

It is essential for the students to realize why they are arranging the mela. Tell the students that by arranging a mela, they can not only share their knowledge and the findings from the surveys, visits and activities with the other students in the school, but with the community members, including parents, local government officials, etc.

Before you decide to organize the mela, you should talk to the principal and take permission for the same. You should try and arrange the mela in the school premises, but if this is not possible, you will have to make arrangements for a venue like an open ground or community hall.

Planning

An important component of any mela is the fun. So when they plan the activities for a mela, students have to keep this in mind. The Mela can have a number of activity and exhibition areas or 'stalls', all on the environmental themes. They can choose a particular theme for the year (water, energy, etc.) or choose all the themes.

The mela can be arranged such that it has various interactive games, skits, puppet shows, puzzles and other activities that can involve a large crowd, as well as exhibit posters, competitions, skits, dramas, etc. Some of these activities are discussed on the following pages.

Divide the students into groups on the basis of the planned activities. The number of students in each group will depend on the activities. For example, in the Games Corner, you can assign 1 to 2 students per game. If the students plan to have 4 games, then the number of students in the Games group can be approximately 8.

Tell each group that they will be responsible for their stall—from planning the activities, to putting up posters, conducting the activity, and decorating and managing the stalls.

Each group can make a list of all the things they require for their corner/stall. Once that is ready, you should ask the group responsible to make appropriate arrangements, or you can assign two to three students the responsibility of buying the materials required for the mela and making them available for the rest of the class.

Games

You can modify the Snakes and Ladder game. You can draw a large grid on the floor and put messages of good and harmful activities for the environment. About 4 players can play the game at a time.

Competitions

As a part of the mela, you can arrange some competitions. These could be based on the activities organized and the posters displayed.

- One of the competitions could be poster making, slogan writing etc. For this you can either give a specific theme, like problems or conservation, or it can be general, relating to any aspect of the environment.
- You can also arrange a quiz related to environment. This can consist of some simple questions.

Art and Craft

This corner can be a 'Do it Yourself' corner where everyone can make greeting cards, clay models, pebble painting, etc. Students can perform skits related to different aspects of the environment. They can modify existing stories or create their own play. A play can effectively convey to the people the need to save precious resources like water, energy, biodiversity.

Handouts

One of the groups can prepare an attractive handouts. This can be given as a take-away to visitors. Some aspects which can be covered are:

- Tips on how to save water, electricity, fuel, etc.
- Tips based on the "How to Section"

Reminding them to present the information in a brief, simple and reader-friendly style.

Feedback

One stall of the Mela can be a feedback stall. Here you can ask the people to give their comments on the mela. For this you can make a visitor book in which they could record their comments.

A special corner in the Feedback stall can be called "Become Paryavaran Mitra". Encourage visitors to write down how they think they can contribute towards protecting the environment, and what steps they can take as individuals and in their home and workplace to become Paryavaran Mitra. For this, you can place two to three large sheets of blank chart paper on soft boards.

Plan an Eco-friendly Event

Avoid use of polythene

Use Steel/ glass/ paper/ earthen or bamboo glasses for guests and visitors The 3Rs principle of reduce, reuse and recycle should be practiced. Paper or cloth folders/bags should be used for giving resource material.

Use of papers and other materials

Use of paper for invitation, and other purposes should be minimal. Wherever possible, e-mail may be used in place of post or courier. This reduces cost and also use of paper. All wastes generated during the programme, should be sent for recycling or should be sold. One-side used papers may be used for rough work or internal notes.

Use of electrical/ electronic gadgets

All items run by electricity should be used only under necessary condition. Switch off lights, fans or other electrical gadgets during unused periods.

Water and sanitation aspects

a. Safe drinking water facilities: All programmes must have safe drinking water facilities.

b. Sanitation facilities: There should be water for flushing. Proper signage indicating Toilet/ Lavatory/Urinal should be put up (if permanent board is not there, temporary signages should be put up).

c. Hand washing facilities: There must be proper hand washing facility with water and soap in all programme venues.

d. Cleaning of the venue: The venue, i.e. the hall, classroom, and the verandah, should be cleaned properly.

Waste disposal

a. There should be waste bins inside or outside venue for disposing the paper and other wastes.

b. Food waste and non-biodegradable waste should be kept separately. Food waste generated should be disposed properly in a bio-compost pit or should be sent to municipal dumping facility. Any plastic or non-biodegradable wastes should be kept and sent for recycling.

Bouquet or gifts

For welcoming a guest or a resource person, a live potted plant may be given instead of flower bouquet. Any gift item given to resource persons or participants should not be wrapped with polythene wrapping.

Annexure 1

Introduction

The NCERT has published a set of Project Books in Environment Education. The project books have been prepared to further students' involvement and active participation in environmental issues. This will enable them to understand the environmental problems in their vicinity, work on them to obtain first had information, and come out with their own solution.

There is a project book for each class VI, VII, VIII. Each book includes twenty projects with the headings – title, background, methodology, conclusion and activities that can be taken up as follow up actions. The topics have been chosen keeping in view the environmental concerns that have been discussed in various textbooks for the class. An attempt has been made to make the projects workable in different concerns of the country.

The table below gives an overview of the topic and the objectives of the suggested project for classes VI, VII and VIII.

Suggested Projects from Project Book in Environment Education for Class VI

Topic	Objectives
Reducing wastage of food	To understand the need to reduce wastage of food
Nutrients in food	To assess whether our diet includes essential nutrients
Getting to know trees	1. To understand whey trees are important to us. 2. To identify different trees in a school/ colony and know their unique features
Where do animals live?	1. To know about the different types of habitat of animals. 2. To develop respect for all living beings.
Creating your own garden	1. To find out the different types of flowers that are usually grown in gardens in your area. 2. To prepare a plan to set up a small garden.
Controlling vehicular pollution	1. To appreciate the necessity of checking pollution level of vehicles. 2. To become aware of the responsibility of vehicle owners.

All plants are useful	1. To know about different plants and their relationship with the environment. 2. To understand their importance, value and the need for their conservation.
Life in diverse regions	1. To reflect on the life of animals and humans in different climatic conditions. 2. To get sensitised towards the impact of changes due to climatic conditions on the life of tiny organisms, animals and humans.
Social interdependence Compassion for living creatures	To understand the importance of interdependence between people engaged in various occupations. 1. To find out how people treat domestic animals, pets and stray animals. 2. To promote compassion, protection and care towards animals.
Beauty in diversity Sharing space	1. To appreciate the diversity of interests and preferences among individuals 2. To study the interdependence among different creatures in a house
Importance of terrace farming	1. To know the process of terrace farming. 2. To understand how it helps in retaining water in the soil in steep slopes of hilly areas. 3. To understand how terrace farming helps in preventing soil erosion.
Development of urban slums	1. To find out why slums come up. 2. To understand the living conditions in slums.
Exploring historical objects and places	1. To focus on different aspects of a historical object or place to know the past. 2. To appreciate the value of heritage.
Knowing about cave art	1. To understand the significance and purpose of cave art. 2. To interpret human and animal motifs in cave art. 3. To develop skills of observation.

Exploring community craftspersons	1. To be aware about local crafts. 2. To appreciate the skills of the craftsperson.
Exploring the history of a village or a city	1. Prepare a brief history of one's own village/city.
Great personalities of the past	To know and learn from the life and works of renowned personalities of the region.
Let's keep our surroundings clean	1. To develop healthy habits of keeping the environment clean. 2. To be morally responsible for the upkeep of one's surrounding.

Suggested Projects from Project Book in Environment Education for Class VII

Topic	Objectives
Knowing some plant diseases	1. To recognise and observe plants with diseases. 2. To find out the organisms causing the diseases.
Diseases associated with the human digestive system	1. To know the diseases that are associated with the digestive system in human beings. 2. To know about the organisms which cause the diseases.
Fibres obtained from animals	1. To identify animals from which we obtain fibres. 2. To find out the places where these fibre producing animals are found. 3. To find out how the fibres are used.
Exploring sericulture	1. To know about the different steps and skills involved in sericulture. 2. To observe the rearing of silkworm and the production of silk yarn. 3. To be aware of the hazards of sericulture practices.
Drastic changes in environment disturb well adapted animals	1. To understand that diversity in animal world is largely due to adaptation. 2. To know how changes in the environment affects the life of animals.

Study of migratory birds	To know about the migratory birds of a place.
Cyclone and its impact	1. To find out the places prone to cyclone. 2. To know about the reasons why cyclones occur. 3. To find out the damage caused by cyclone.
Pottery as a craft	1. To learn the steps involved in pottery making from clay to finished product. 2. To develop appreciation of art in pottery.
Forests: Our treasure Preventing wastage of electricity	To know and understand the importance of forests. 1. To create awareness about the need for conservation of electricity. 2. To be sensitised about avoiding excessive use of electricity.
Creating awareness about wastage of water due to negligence	1. To bring into notice how water is being wasted in daily life activities. 2. To be sensitised about judicious use of water.
Water harvesting	1. To know about water harvesting. 2. To learn the benefit of harvesting rain water.
My tree neighbours	To be aware of the varieties of trees in our neighbourhood and their usage.
Changes in the surroundings and their effect	To learn about the changes taking place in the physical environment/landscape and their effect.
Preservation of historical structures our responsibility	To understand the importance of preserving structures with historical importance.
Save paper, save tree and save environment	1. To learn about the importance of conserving paper. 2. To develop awareness on wastage of paper and its implication.
Waste in the market: Where does it go?	1. To identify the different kinds of wastes generated in a market. 2. To understand through observation the impact of waste on the environment.

Every animal has a positive role in the environment	1. To understand that special features of animals and birds reflect their adaptation to the environment. 2. To appreciate the role and relationships of animals and birds in the environment. 3. To develop love and respect for all life forms.
Pets! To have or not to have	1. To develop love and respect for animals and pets. 2. To know the practices involved in care of pets.
Industrialisation, Globalisation and indigenous crafts	1. To understand the impact of globalisation on the local artists and cracftpersons, and their livelihood. 2. To understand the need of promoting and conserving the local and indigenous arts and crafts. 3. To appreciate the need for upgradation of tools and skills.

Suggested Projects from Project Book in Environment Education for Class VIII

Topic	Objectives
Elixir of Life - Water	1. To be sensitised about the effect of discharge of sewage into water bodies. 2. To be aware of the fact that polluted water is harmful for health.
Noise pollution	1. To develop a sense of appreciation about some natural and man-made sources of sound. 2. To explore the impact of unpleasant sounds and noise pollution.
Global warming	1. To investigate the impact of greenhouse effect through simulation.
Estimation of particulate pollutants in air	1. To be aware of the fact that particulate matters are one of the pollutants of air.
Death trap	1. To be sensitised to the need for adopting proper practices to dispose of wastes.

Where should the waste go?	1. To be able to classify different types of waste materials depending upon the rate of their decomposition or rotting. 2. To be able to suggest suitable ways for household solid waste disposal.
Fossil fuel is not forever	1. To be sensitised about the judicious use of energy fossil fuels. 2. To think and suggest ways of conserving fossil fuels.
Judicious use of fuels	1. To be aware about the judicious use of fossil fuel
Diseases and their prevention	1. To know micro-organisms that causes diseases in human. 2. To find out some preventive measures against those micro-organisms.
Mosquitoes woes	1. To develop awareness about the diseases spread by mosquitoes. 2. To find preventive measures for such diseases.
Vaccination – A shield	1. To find out different diseases against which vaccination is done. 2. To make people aware about the importance of vaccination.
Dangers of deforestation	1. To identify the causes of deforestation. 2. To identify the impact of deforestation.
Judicious use of water in irrigation	1. To be aware of the various means of irrigation, both modern and primitive. 2. To be familiar with the harmful effects of over-watering.
Quality of soil and crop production	1. To realise that excessive use of chemical fertilizers makes the soil acidic or alkaline. 2. To be aware that excessively acidic and alkaline soil affects growth of plants.
Pollution and diseases	1. To be sensitised about various causes of pollution and the measures to control them.

	2. To know about pollution-related diseases.
Pests – Uninvited guests	1. To find out the different pests that attack stores grains. 2. To find out measures to control these pests.
Abode of wildlife	1. To develop understanding about national parks and wildlife sanctuaries and their inhabitants.
Monitoring of air pollution	1. To be sensitised about the level of air pollution in cities.
Hazards of air pollution	1. To investigate the impact of harmful gases on electronic items.
Saviours of our environment	1. To be acquainted with the work of an environmentalist, or an environment movement, that has an impact on policy decision or course of development.

References

Several activities in this Handbook have drawn upon Indian and international environmental education experiences and material. We acknowledge the sources from where we drew inspiration and ideas.

Al Daleel Al Be-e, A Guide to setting up Environmental Clubs, Mamata Pandya, Rajeswari N. Gorana, Gayatri Raghwa, Environmental Agency-Abu Dhabi and CEE, 2009.

Building Blocks, From Environmental Awareness to Action, a Teachers' Manual, Meena Raghunathan, CEE, 2003.

Conserving Our Water Resources, Handbook of Environmental Education Activities for Teachers for standards 5-8, Kiran B. Chhokar, CEE, 1988.

DIShA for Sustainable Development--a Facilitator's Handbook; Mamata Pandya, Madhavi Joshi and Rajeswari Namagiri, CEE, 2008.

Education for Sustainable Development, a Resource Handbook for National Green Corps Educators, Mamata Pandya and Madhavi Joshi, CEE, 2010.

Energy: A Teacher's Manual, EnviroScope Series, Series Editor, Kiran B. Chhokar, CEE & World Resources Institute, Oxford & IBH Publishers, 2000.

Energy Matters, a School Energy Education Guide, Meena Raghunathan, CEE, 2000.

Environmental Education Handbook, Mamata Pandya and Rajeswari Namagiri, CEE, 2005.

Floods and Drought, an Educational Package for Standards 5-8, Mamata Pandya and others, CEE, 1987.

Joy of Learning - I for National Centre of Educational Research and Training, CEE, VASCSC, VIKSAT, Darpana Academy of Performing Arts, 1986.

Joy of Learning - II, CEE, VASCSC, VIKSAT, Darpana Academy of Performing Arts, 1996.

Joy of Learning - III, Mamata Pandya, Meena Raghunathan, CEE, VASCSC, 2005.

Discovering Desserts, NatureScope India, Series Editor, Mamata Pandya, CEE, 2005.

The Green Action Guide, A Manual for Planning and Managing Environmental Projects, Meena Raghunathan, Mamata Pandya, CEE, 1997.

The Green Teacher, Ideas, Experiences and Learnings in Educating for the Environment, Meena Raghunathan & Mamata Pandya, CEE, 1997.

Young in Green Action, Inspiring stories from the National Green Corps, 10 years of the National Green Corps, Edited by Shailaja Ravindranath and Sukhprit Kaur. Ministry of Environment and Forests and CEE, 2010

Comprehensive and Continuous Evaluation, Manual for Teachers for Classes 6-8, Central Board of Secondary Education, 2010.

National Curriculum Framework 2005, National Centre of Educational Research and Training, 2005

Syllabus for Classes at the Elementary Level--Volume 1, National Centre of Educational Research and Training, 2006.

http://subirshukla.blogspot.com/

ENVIS centre on Environmental Education (EE)

ENVIS is a network of subject-specific centres set up by the Ministry of Environment and Forests, Government of India, to disseminate environmental information. CEE is an ENVIS (Environmental Information System) centre on Environmental Education (EE) and strives to disseminate information related to Environment Education (EE) and Education for Sustainable Development (ESD). Teachers, students, parents, EE and ESD professional are welcome to use any of the following for their information needs:

1. Have a query? Ask us 2. Visit www.greenteacher.org 3. Subscribe or contribute to the newsletter Education for Change. 4. Avail faclities at CEE Information Service Centre, Ahmedabad

Email to cee.envis@ceeindia.org

Write to ENVIS Officer-In-Charge, CEE Ahmedabad, Thaltej Tekra, Ahmedabad 380 054

The Ministry of Environment & Forests (MoEF)

The Ministry of Environment & Forests (MoEF) is the nodal agency in the administrative structure of the Central Government for the planning, promotion, co-ordination and overseeing the implementation of India's environmental and forestry policies and programmes. The National Green Corps (NGC) started in 2001 is a nationwide programme of MoEF for environmental action through Eco- clubs. Each district in India has up to 250 schools which receive financial and technical support as part of the programme. 30-50 students are a members of each Eco - club. At present there are about 90000 Eco- clubs working across the states. The programme is facilitated by 43 agencies/organizations across the country. Each state has a nodal and resource agency that implements and provides technical support for capacity building and development of material.

http://moef.nic.in/index.php

Centre for Environment Education (CEE)

CEE is a national institute of excellence for Environment Education supported by the Ministry of Environment and Forests, Government of India, and is affiliated to the Nehru Foundation for Development, CEE's main objective is to create environmental awareness among children, youth, decsion makers and the general community. CEE works in partnership with a range of organisations at the national, regional and international level. The strategy is to collaborate with others to build synergies, achieve a multiplier effect, enhance effectiveness and widen the range of the programmes.

www.ceeindia.org

ArcelorMittal

ArcelorMittal is the world's leading steel company, with over 326,000 employees in more than 60 countries. ArcelorMittal is committed to the sustainable management of the environment and of finite resources. ArcelorMittal recognises that it has a significant responsibility to tackle the global climate change challenge: it takes a leading role in the industry's efforts to develop breakthrough steelmaking technologies and is actively researching and developing steel-based technologies and solutions that contribute to combat climate change.

www.arcelormittal.com

The Paryavaran Mitra programme works in partnership with a wide range of organizations and institutions from the international to the local level. The partnerships under the Programme do not imply the endorsement of products or services of any of the partner agencies, and such partnerships create no legally binding relationships unless otherwise explicitly stated, in a separate agreement, between the parties.

HAND PRINT
Action Towards Sustainability

Increase your Handprint!

Decrease your Footprint!

Paryavaran Mitra is a nationwide initiative to create a network of 2 crore young leaders, from schools across the country, having awareness, knowledge, commitment and potential to meet the challenges of environmental sustainability at their spheres of influence. As a Paryavaran Mitra, a student demonstrates environmental leadership qualities through positive change in behaviour and Hand Print action at individual, school, family and community levels.

Hand Print is a measure of positive environmental action. It refers to an individual's efforts that help to improve the conditions for life on our planet, today and in future. The Hand Print actions positively impact three aspects of sustainability: environment, society and economy.

The Hand Book is a comprehensive ready reference for teachers in any school to motivate and guide students to be Paryavaran Mitra, and to facilitate the whole school community to take Hand Print actions.

The Hand Book includes information, and a menu of active teaching-learning methods, and action projects, to engage students in exploring, discovering, thinking, sharing, and take action. It encourages the use of immediate school environment and the local environment as resources for teaching and learning, and arenas for demonstrating positive action.

It is this process through which a Paryavaran Mitra student becomes a change agent for sustainability.

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